

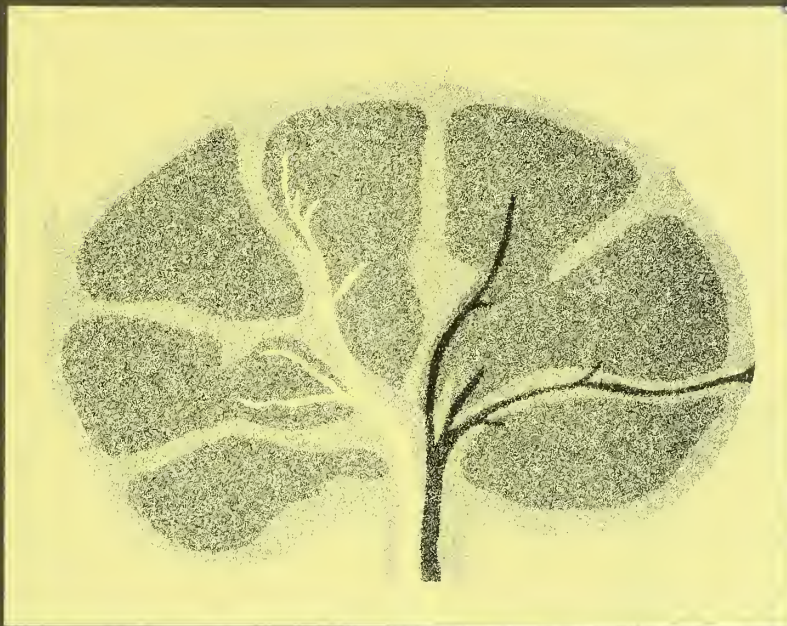
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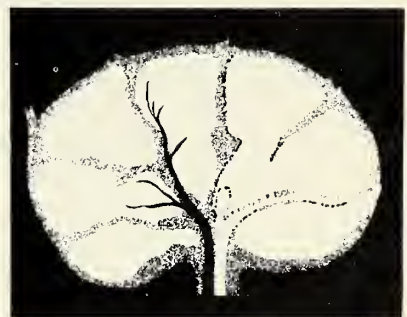
LYMPH NODES OF CATTLE, HOGS, SHEEP, AND HORSES

United States Department of Agriculture
Food Safety and Quality Service
Meat and Poultry Inspection
Program Training Division

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Program Training Division
P.O. Box 1608, Denton, Texas 76201

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THE LYMPHATIC SYSTEM

LYMPHOCENTERS OF THE HEAD

Lymphocenter	Lymph Node (New Name)	Lymph Node (Old Name)
MANDIBULAR	Mandibular	Mandibular
PAROTID	Parotid	Parotid
RETROPHARYNGEAL	Medial Retropharyngeal Lateral Retropharyngeal	Supratharyngeal Atlantal

LYMPHOCENTERS OF THE NECK

Lymphocenter	Lymph Node (New Name)	Lymph Node (Old Name)
SUPERFICIAL CERVICAL	Superficial Cervical	Prescapular
DEEP CERVICAL	Cranial Deep Cervical Middle Deep Cervical Caudal Deep Cervical	Anterior Cervical Middle Cervical Posterior Cervical (Prepectoral)

LYMPHOCENTER OF THE THORACIC LIMB

Lymphocenter	Lymph Node (New Name)	Lymph Node (Old Name)
AXILLARY	Proper Axillary	Axillary

LYMPHOCENTERS OF THE THORACIC CAVITY

Lymphocenter	Lymph Node (New Name)	Lymph Node (Old Name)
DORSAL THORACIC	Intercostal	Intercostal
VENTRAL THORACIC	Cranial Sternal Caudal Sternal	Sternal
MEDIASTINAL	Cranial Mediastinal Middle Mediastinal Caudal Mediastinal	Anterior Mediastinal Middle Mediastinal Posterior Mediastinal
BRONCHIAL	Left Tracheobronchial Right Tracheobronchial	Left Bronchial Right Bronchial

LYMPHOCENTERS OF THE ABDOMINAL & PELVIC WALL

Lymphocenter	Lymph Node (New Name)	Lymph Node (Old Name)
LUMBAR	Lumbar Aortic Renal	Lumbar Renal
ILIOSACRAL	Medial Iliac Lateral Iliac Sacral Anorectal	Internal Iliac External Iliac Sacral Anal
INGUINOFEMORAL (SUPERFICIAL INGUINAL)	Mammary Scrotal Subiliac	Supramammary Superficial Inguinal Prefemoral
ISCHIATIC	Ischiatic	Ischiatic

LYMPHOCENTERS OF THE PELVIC LIMB

Lymphocenter	Lymph Node (New Name)	Lymph Node (Old Name)
ILIOFEMORAL (DEEP INGUINAL)	Iliofemoral	Deep Inguinal
POPLITEAL	Deep Popliteal	Popliteal

LYMPHOCENTERS OF THE ABDOMINAL VISCERA

Lymphocenter	Lymph Node (New Name)	Lymph Node (Old Name)
CELIAC	Gastric Hepatic Celiac	Gastric Hepatic (Portal) Splanic
CRANIAL MESENTERIC	Cranial Mesenteric	Mesenteric
CAUDAL MESENTERIC	Caudal Mesenteric	Mesenteric

INTRODUCTION

The lymphatic system is widely used as an evaluation tool in meat inspection. In many cases the decision whether a carcass is wholesome or not is determined by what is found upon examination of the lymph nodes and associated structures. It is important, therefore, that meat inspection personnel know the anatomical location of lymph nodes in the various species of animals presented for slaughter. Also, when making carcass dispositions, the veterinarian must frequently rely on his or her knowledge of the afferent and efferent drainage of lymph nodes so that he or she can determine the pathogenesis of a disease process.

The purpose of this revised guideline is to update the original version and to expand it somewhat to include the equine. Since the original Guideline 5 was written, many of the names of the lymph nodes have been changed. However, to make it less confusing, both the new and old names of the nodes will be listed. The old name will be in parentheses.

THE LYMPHATIC SYSTEM

The lymphatic system consists of the lymph vessels and nodes that are engaged in conveying the lymph. Its basic function is to drain extracellular fluid from the tissue interstices back into the blood stream and thus prevent the accumulation of extracellular materials. It also acts as a defense mechanism against bacteria and other noxious materials by filtering them out of tissue fluid and phagocytizing them.

The Lymph - Lymph is a clear, colorless fluid except in the intestinal vessels, in which, after digestion, it is milky in color and is termed "chyle." Lymph is generally considered to be identical with extracellular fluid, but in fact the fluid contained within lymphatics may differ markedly from that contained within the extracellular space of tissues. Therefore, it is more correct to consider lymph as only that fluid contained within lymphatic vessels and not to include the entire extracellular space outside of blood vessels.

The composition of lymph from various tissues varies with the relationship of the lymph capillaries to blood capillaries and with the amount of material produced by parenchymal cells of the tissues that finds its way into the lymphatics. Lymph has a specific gravity of about 1.015. It contains lymphocytes, and normally a few red cells are present. Neutrophils are normally absent; however, they may be present in great numbers in infections. Platelets are absent. Lymph does contain fibrinogen and prothrombin, and all lymph will clot slowly. Lymph contains water, gases, proteins, nonprotein nitrogenous substances, glucose, inorganic substances, hormones, enzymes, vitamins, and immune substances.

The Lymph Vessels - The lymph vessels start as blind-ending, finger-like, thin-walled capillaries in the connective tissue. They form three-dimensional capillary networks that drain into the larger and thicker-walled lymph vessels, the lymph ducts, and the trunks. The content of these large trunks and ducts then empties into the cranial vena cava at the thoracic inlet. Lymph vessels are absent from regions lacking in connective tissue, such as the parenchymatous portions of the liver, spleen, tonsils, and lymph nodes. Nor are lymph vessels found in the bone marrow, central nervous system (except the meninges), umbilical cord, embryonic membranes, hyaline cartilage, epithelial layer of the skin, cornea, lens, or vitreous humor of the eye.

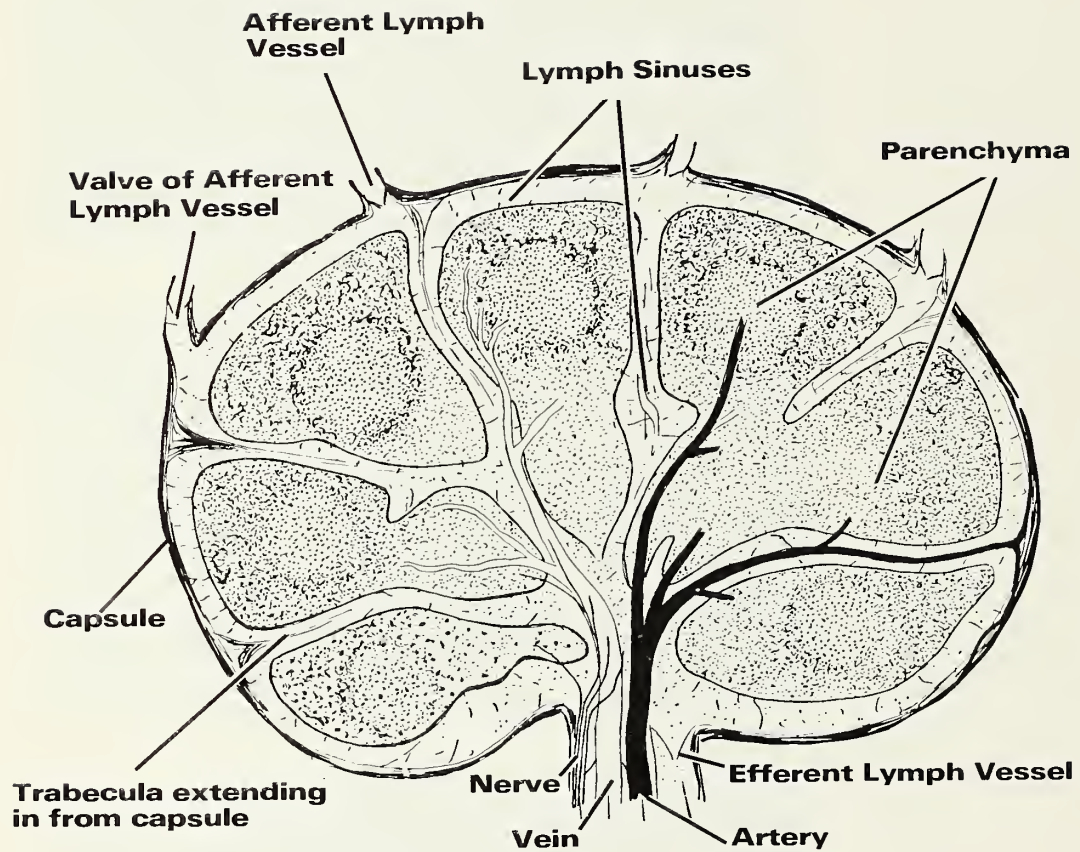


Figure 1
DIAGRAM OF A TYPICAL LYMPH NODE

THE LYMPHATIC SYSTEM

[continued]

The lymph capillaries consist of an endothelial tube embedded in connective tissue, ending blindly in rounded or slightly enlarged ends. Compared to blood capillaries, the lymph capillaries lack a surrounding basement membrane, a layer of pericytes. This fact probably accounts for their ability to absorb macromolecules from tissue fluid and inflammatory exudates more readily than the blood capillaries.

All lymph vessels with the exception of capillaries contain valves. Smaller vessels often have only one fold-like valve while the rest have two leaflets. Some of the larger valves may have muscular fibers which help move the lymph. The lymph moves very sluggishly in the lymph vessels. The movement from the periphery to the center is affected by pressure gradients brought about mainly by forces outside of the lymphatic system. Factors influencing the lymph flow are: (1) respiratory movements, (2) abdominal pressure, (3) intestinal peristaltic movements, (4) increase in blood pressure, (5) venous congestion, (6) pathological conditions, and (7) increase of body temperature. Lymph flow may also be affected by anesthesia and various drugs.

The Lymph Nodes - On the course of the lymph vessels are situated discrete nodular structures called lymph nodes (Figure 1). They consist of an accumulation of lymphatic tissue enclosed by elastic fibers and smooth muscle fibers containing a connective tissue capsule, from which trabeculae and septi pass into the parenchyma of the node. Under the capsule and around the trabeculae and septi extends a complex system of lymph sinuses. These sinuses are lined with endothelium. The sinus under the capsule is called the "marginal sinus" and those around the septi and trabeculae are called the "intermedial sinuses." The sinuses in the medullary substance (parenchyma) are the "medullary sinuses," which join and form the "terminal sinus" at the hilus of the lymph node.

The lymph vessels that carry lymph to the lymph node are called **afferent** lymph vessels. They enter the marginal sinus. The **efferent** lymph vessels carry the lymph away. They start at the terminal sinus. In swine, the situation is reversed—the afferent vessels enter the center and the efferent vessels start at the periphery of the lymph node.

THE LYMPHATIC SYSTEM

[continued]

A great number of lymphocytes are formed in the lymphatic tissue of the lymph nodes. From here they enter the efferent lymph vessels. The lymphocytes play an important part in protecting the body from infections.

Lymph nodes vary considerably in consistency, shape, size, and color. In young, rapidly growing animals the nodes are rather prominent and contain more fluid; in old and mature animals they are more firm and compact. Sometimes in old milk cows the lymph nodes may be rather prominent, but they are usually fibrous in texture. The visceral lymph nodes are softer in structure than those in other parts of the body, those of the abdominal digestive organs containing more fluid, especially during absorption from the intestines. Lymph nodes may be flattened, round, cylindrical, or kidney-shaped. They vary in size from pin-point to several centimeters in length.

The cortical portions of many lymph nodes are white or light gray, while the medullary portions are rather dark in color. Mesenteric nodes may have a wide array of colors ranging from white to dark gray, brown, red, or even black. Black lymph nodes, or mottled black and white ones, while not normal, cannot always be said to be diseased, since the color may be due to mere disposition of normal pigment or to carbon particles that have no special significance, at least from a meat-inspection standpoint. Blood and tissue pigments may be present due to tissue destruction somewhere upstream.

Hemal nodes are lymphatic tissue organs that differ from lymph nodes in color and in the absence of afferent and efferent lymph vessels. Hemal nodes are deep red or dark brown in color and are usually not larger than 1 - 1 1/2 cm.

Hemal nodes are numerous in ruminants. The reddish dark lymph nodes of swine have commonly been mistaken for hemal nodes; however, the color appears to be the result of the mechanical breakdown of the endothelial lining of the small blood vessels and sinuses during the killing operation.

The Lymphocenter - A lymphocenter is a lymph node or a group of lymph nodes that occurs constantly in the same region of the body and receives afferent vessels from approximately the same regions in all species.

THE LYMPHATIC SYSTEM [continued]

Importance of Lymph Node Inspection - From the standpoint of meat inspection, it is well to remember that foreign and deleterious matter that has been taken up by the lymph on its passage through the tissues is usually removed or destroyed by a process of filtration or by chemical counteraction. The bacteria filtered out or retained by the lymph nodes are often destroyed and disintegrated. That is not always the case, however, since bacteria can pass through a lymph node without leaving any trace of their passage. The retained bacteria are destroyed by phagocytic action or, if not destroyed, may produce disease in the nodes.

Lymph nodes are scattered throughout the body, and, in general, the condition of each node reflects the health or disease of the area from which the afferent vessels are derived. Also, the number of nodes reacting to a disease process gives an indication of the extensiveness of the disease. By inspecting lymph nodes, the inspector makes a decision on the health of the animal. If a disease condition is found, the inspector depends on his or her observation to decide whether it is localized or generalized—a decision that aids in determining the wholesomeness of the meat for food purposes.

LYMPHOCENTERS OF THE HEAD

Figure 2

LYMPH NODES OF CATTLE HEAD

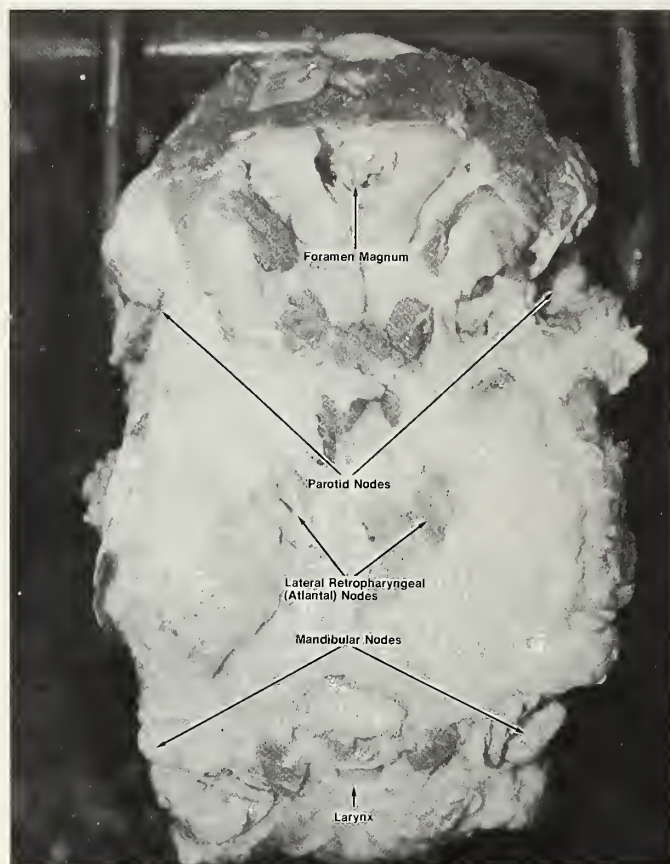
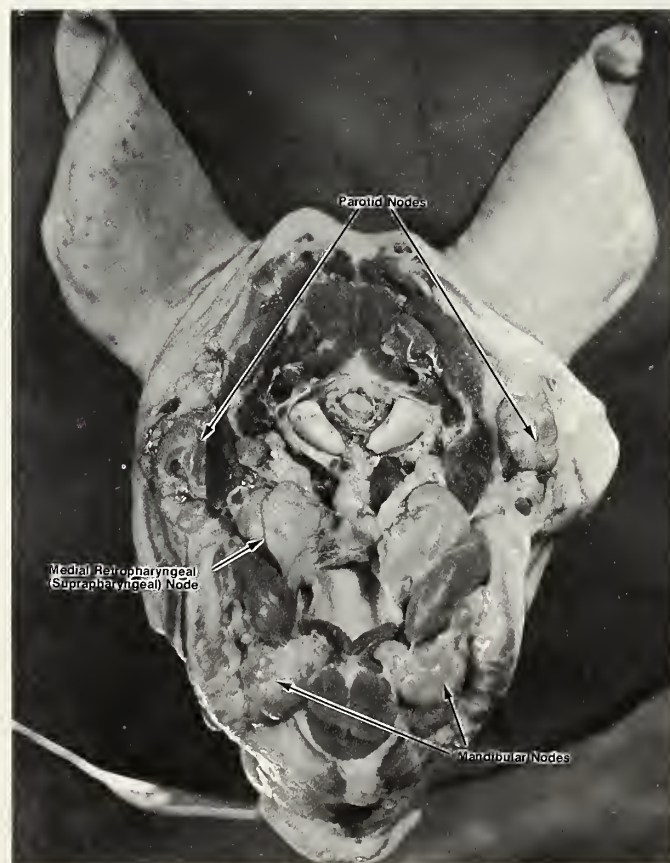


Figure 3

LYMPH NODES OF SWINE HEAD



LYMPHOCENTERS OF THE HEAD

[continued]

The term "lymphocenters of the head," as used by the Meat and Poultry Inspection Program, includes the mandibular, parotid, and retropharyngeal lymphocenters. The lymph nodes located in these lymphocenters are very important in inspection and must be examined carefully. In hogs, especially, these nodes frequently present the first and often the only lesions of tuberculosis found in the carcass.

The Mandibular Lymphocenter - The *mandibular lymph nodes* in cattle are located in the lower portion of the mandibular space, between the sternocephalicus muscle and the ventral part of the mandibular salivary gland. Usually, there is one node on each side, but occasionally there may be two nodes lying very close to each other (Figure 2).

In hogs, these nodes are covered laterally by the cutaneous muscles and by the parotid salivary glands. The nodes lie more posteriorly than in cattle (Figure 3).

In sheep one or two flattened kidney-shaped lymph nodes are found on the lateral aspect of the mandibular salivary gland, ventral to the parotid salivary gland.

In horses the nodes are V-shaped and are 10 to 16 cm in length and 2.0 to 2.5 cm in width. They are located rostral and caudal to the incisura vasorum facialis.

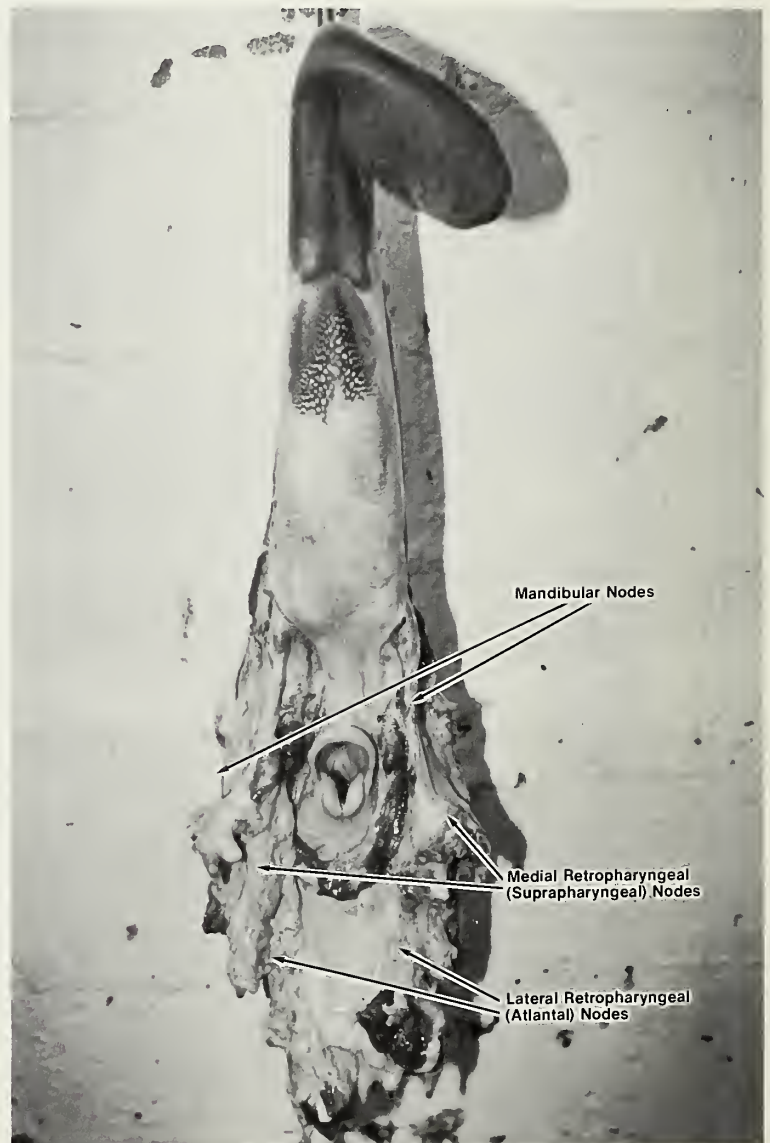
The afferent vessels come from the muzzle, lips, cheeks, hard palate, rostral part of the nasal cavity, gums (in part), tip of tongue, sublingual, parotid, and maxillary glands. Afferents are received also from the skin, subcutis and muscles of the head (except those of the eye and ear), the muscles of the hyoid apparatus, and the pterygoid lymph node, when present. The efferent vessels go to the lateral retropharyngeal lymph nodes.

LYMPHOCENTERS OF THE HEAD [continued]

When cattle are slaughtered the head is severed from the carcass, prepared for inspection, and then either suspended from a hook inserted in the foramen magnum or placed face downward on a metal head-inspection rack. The tongue may then be removed and placed next to the head for inspection (tongue-out presentation). If the head is presented for inspection in this manner (tongue out), the mandibular node may be found near the base of the tongue by dissecting through the fatty tissues that were originally located between the angles of the mandible (Figures 4 and 5). If the head is presented for inspection with the tongue left in (tongue-in presentation), the node can easily be found by making a longitudinal incision along the inner border of the sternocephalicus muscles just within the lower border of the mandible.

Figure 4

CATTLE TONGUE-OUT
BASE DOWN PRESENTATION

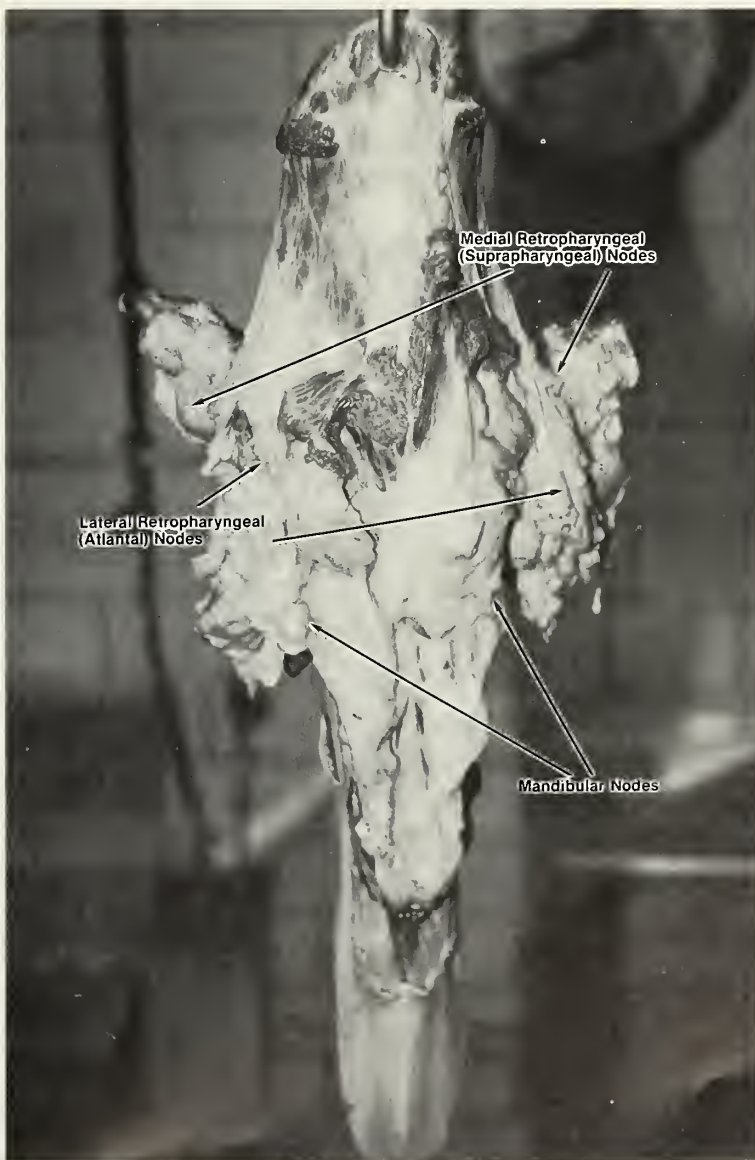


LYMPHOCENTERS OF THE HEAD [continued]

In hogs, a similar method is used in reaching the mandibular lymph node. After the hog carcass is shaved and cleaned on the carcass dressing rail, the head is presented for inspection by either one of the following two methods. It is either removed and placed face downward on a head-inspection rack or it is "dropped" by disarticulating the head at the atlanto-occipital joint, leaving the head hanging free from the carcass except for a small attachment by the skin of the neck. The mandibular lymph nodes, by either method, are partially exposed at the base of the tongue just inside of each angle of the lower jaw.

Figure 5

CATTLE TONGUE-OUT
BASE UP PRESENTATION



LYMPHOCENTERS OF THE HEAD [continued]

Most inspectors use a small metal hook with which the salivary gland is drawn outward and twisted slightly, thus allowing the mandibular lymph node to be easily and rapidly incised for inspection (Figure 6). Both experience and skillfulness with a knife are necessary to locate and incise these nodes rapidly and accurately during inspection.

In sheep and horses none of the lymph nodes of the head is incised during routine postmortem inspection.

Figure 6

INCISION OF MANDIBULAR
NODES OF SWINE



LYMPHOCENTERS OF THE HEAD [continued]

The Parotid Lymphocenter - In cattle, the *parotid lymph node* is located ventral to the temporomandibular joint on the caudal part of the masseter muscle. It is partly or completely covered by the dorsal portion of the parotid salivary gland and is situated lateral to the maxillary and superficial temporal vessels and nerves. The node also lies about 2 cm cranial and ventral to the external meatus of the ear (Figure 2).

In hogs, two to eight nodes are found arranged in a chain along the anterior border of the parotid salivary gland, posterior to the border of the mandible (Figure 3). In the method of slaughter in which the jowls remain attached to the carcass, one or more of the parotid nodes may be left intact on the inner surface of the jowl after the head is removed. When the jowls are removed with the head, the nodes may often be exposed. In some cases, they may be entirely removed with the head and jowls or may remain attached to the carcass, depending upon the plant procedure for removing the head.

In sheep a conglomeration of two to four lymph nodes, less than 2.5 cm in length, may be partly or completely covered by the parotid gland.

In horses they form a small group of 6 to 10 lymph nodes, 0.2 to 9.7 cm in size. Usually they are covered by or embedded in the parotid gland.

The afferent vessels come from the skin, subcutis and most of the muscles of the head (including those of the eye and ear), the eyelids, lacrimal gland, and rostral portion of the nasal cavity. Afferents also are received from the muzzle, lips, gums, temporomandibular joint, and parotid salivary gland. The efferent vessels pass to the lateral retropharyngeal (atlantal) lymph nodes.

The Retropharyngeal Lymphocenter - The *medial retropharyngeal* (suprapharyngeal) *lymph nodes* in cattle are located medial to the stylohyoid bone, embedded in fatty connective tissue on the dorsolateral face of the pharyngeal muscles and lying close together on each side of the median line between the branches of the hyoid bone. These nodes average 3 to 6 cm in length and 2.5 to 4.0 cm in width, although often two or three lymph nodes of smaller size may be present.

LYMPHOCENTERS OF THE HEAD [continued]

In hogs, they are usually much smaller and are situated just caudal to the hyoid bone and extend ventromedial to the wing of the atlas. They are located dorsal to the common carotid artery, internal jugular vein, and vagosympathetic trunk and are on the lateral plane of the larynx and the pharynx at about the ventral end of the paramastoid process of the occipital bone (Figure 3).

In sheep one or two are situated on the dorsolateral wall of the pharynx. They are related laterally to the dorsal end of the thyrohyoid bone, and dorsally to the rectus capitis ventralis.

In horses they are located on the dorsolateral aspect of the pharynx, often extending to the lateral side of the guttural pouches. Caudally they are not clearly distinguishable from the cranial deep cervical nodes.

The afferent lymph vessels are received from the tongue, floor of the mouth, hard and soft palates, tonsils, gums, larynx and pharynx, the caudal portion of the nasal cavity, and the maxillary and palatine sinuses. Afferents also come from adjacent cervical muscles and from the rostral hyoid lymph nodes. The efferent lymph vessels terminate in the lateral retropharyngeal (atlantal) lymph nodes.

It can readily be seen how important these nodes are, from a meat inspection standpoint, as they receive most of the efferent lymph radicles emanating from the entrance to both the digestive and respiratory tracts. These nodes are often the first to show tuberculous infections.

When cattle heads are presented for inspection with the tongue out, the medial retropharyngeal lymph nodes can be easily found at the base of the tongue, near the free end of the hyoid cornua (Figures 4 and 5). When cattle are presented for inspection with the tongue in, the nodes may be exposed by drawing the larynx forward and downward and then by making a transverse incision near the base of the cranium, which will reveal the lymph nodes lying caudodorsal to the pharynx (Figures 7 and 8).

LYMPHOCENTERS OF THE HEAD [continued]

Figure 7

BEGINNING INCISION TO EXPOSE
MEDIAL RETROPHARYNGEAL
(SUPRAPHARYNGEAL) NODES OF CATTLE

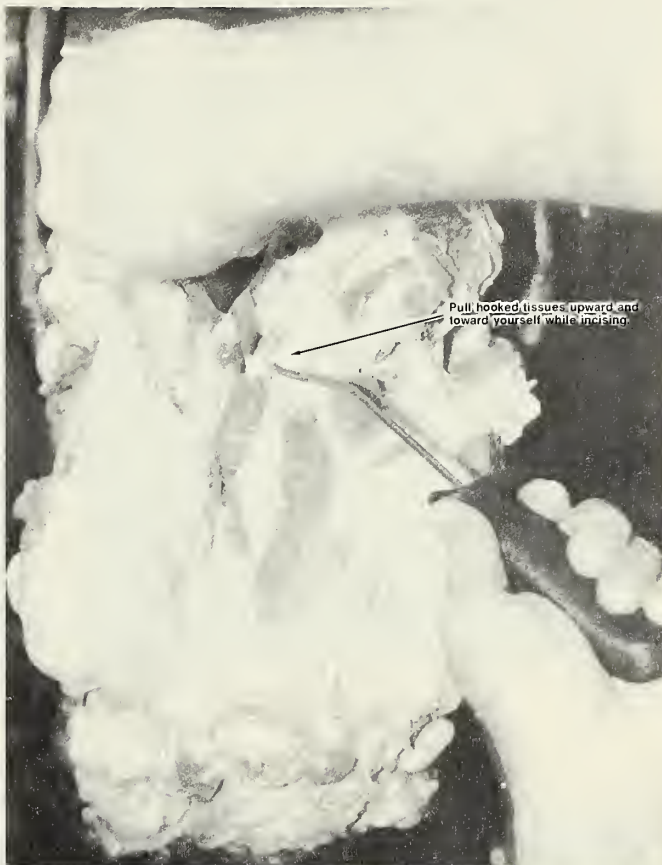
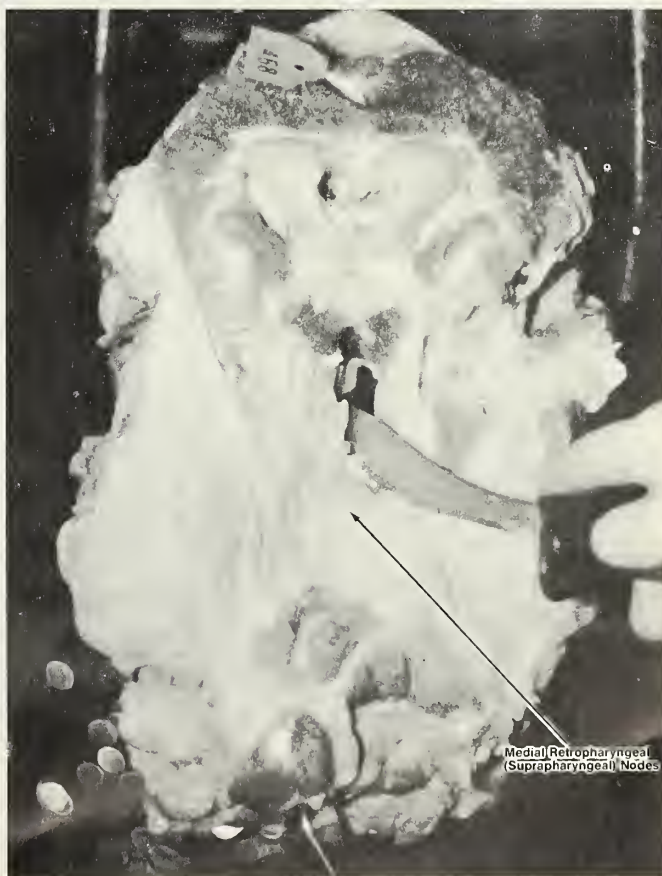


Figure 8

EXPOSED MEDIAL RETROPHARYNGEAL
(SUPRAPHARYNGEAL) NODES OF CATTLE



LYMPHOCENTERS OF THE HEAD [continued]

When hog heads are presented for inspection, the method of locating these nodes is similar to that described for the mandibular lymph nodes, the only difference being the slight variation in location, the medial retropharyngeal nodes being situated in a mass of fat at each side of the larynx and pharynx (Figure 3). They are not as large or prominent as the mandibular lymph nodes.

The **lateral retropharyngeal** (atlantal) **lymph nodes** in cattle are located ventromedial to the wing of the atlas. These lymph nodes lie on the vagus, sympathetic, and accessory nerves. They are dorsal to the carotid artery and are embedded in fatty connective tissue and covered completely, or in part, by the caudodorsal portion of the mandibular salivary gland. Often one larger lymph node is accompanied by one to three smaller lymph nodes (Figures 2, 4, and 5).

In hogs the lateral retropharyngeal lymph nodes are situated along the caudodorsal border of the parotid salivary gland. These nodes are covered partly or completely by the caudal border of the parotid salivary gland.

In sheep one to three lymph nodes are located at the caudal border of the parotid salivary gland, medial to the tendon of the brachiocephalicus muscle and situated between the jugular process rostrally and the rectus capitis ventralis muscle caudally.

In horses these nodes are situated caudoventral to the occipitomandibular part of the digastricus muscle, or ventral to the wing of the atlas on the lateral side of the guttural pouch. They are covered by the parotid and mandibular salivary glands and are often not clearly distinguishable from the medial retropharyngeal lymph nodes.

The afferent vessels come from the tongue, mucous membranes of the oral cavity, gums, lips, hard palate, salivary glands, muscles of the hyoid apparatus, and most of the muscles of the neck. Afferents also are received from the parotid, mandibular, medial retropharyngeal, and rostral and caudal hyoid lymph nodes. The efferent vessels constitute the tracheal trunks.

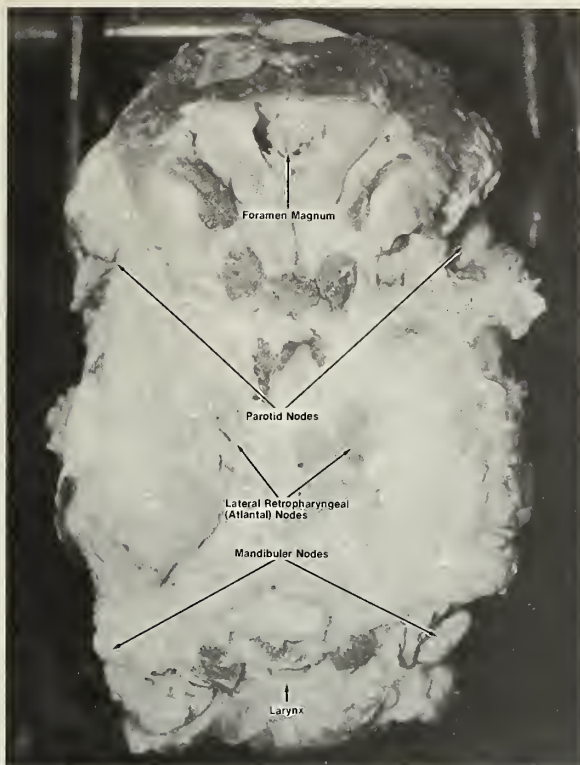


Figure 2



Figure 3



Figure 4

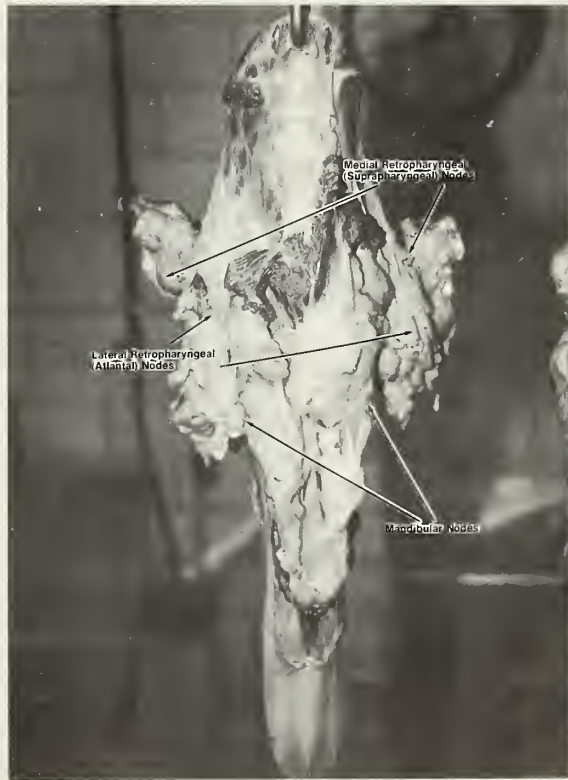


Figure 5

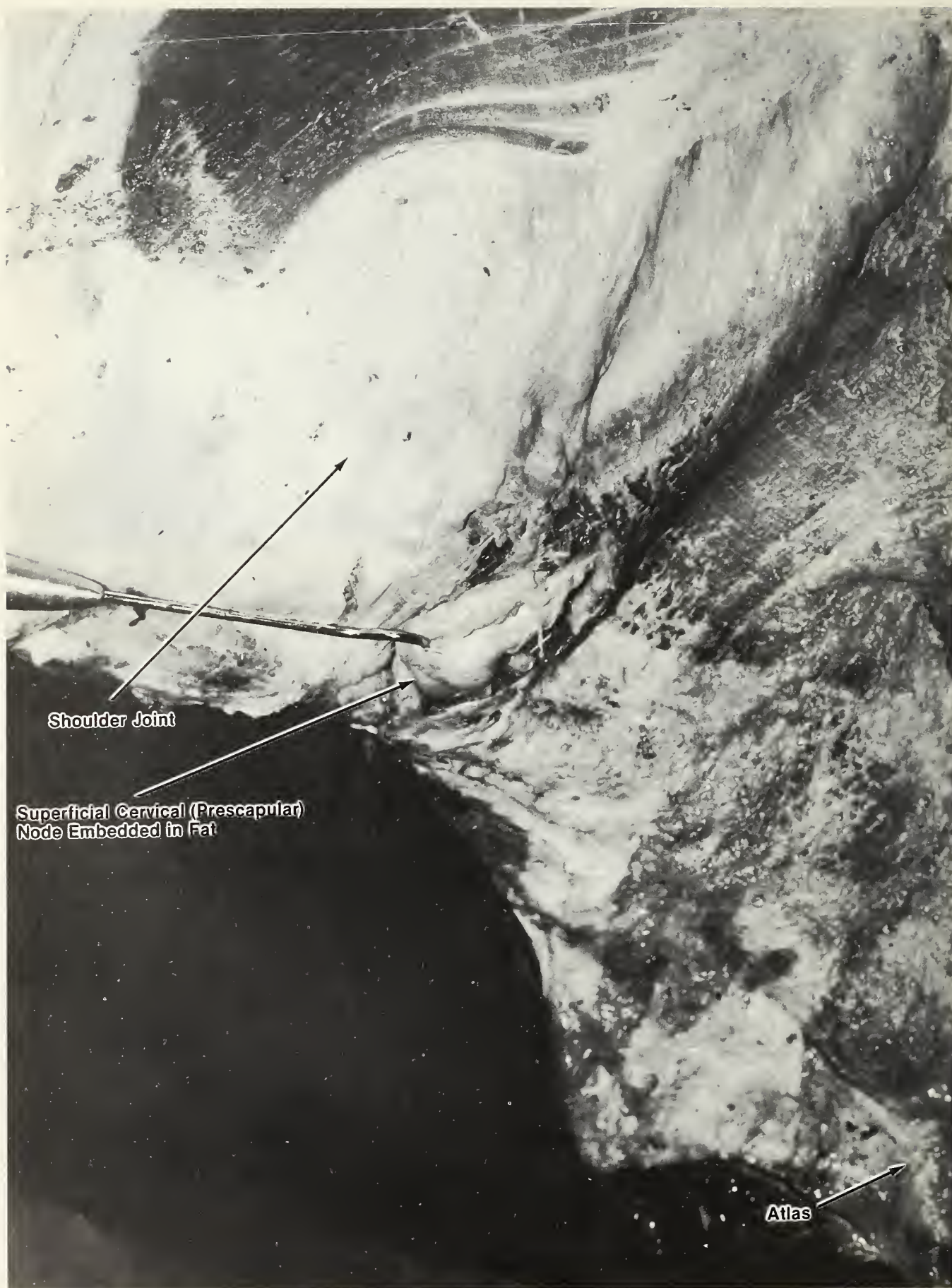


Figure 9

LOCATION OF SUPERFICIAL CERVICAL NODE IN CATTLE

LYMPHOCENTERS OF THE NECK

The Superficial Cervical Lymphocenter - In cattle the **superficial cervical** (prescapular) **lymph nodes** are located craniomedial from the shoulder joints. They are embedded in a cushion of fat with the dorsal two-thirds of the lymph node covered by the omotransversarius and the ventral third by the brachiocephalicus muscle. The nodes are elongated and may attain 10 cm in length and 2.5 cm in width. The nodes may be felt by pressing the hand in the hollow of the shoulder, in front of the neck of the scapula. In a hanging carcass, an incision 7.5 cm long, parallel to the muscle fibers along the dorsal border of the brachiocephalicus muscle just medial from the shoulder joint, is sufficient to allow grasping the node for examination (Figure 9).

In hogs the nodes form a more or less completely fused chain extending from the craniodorsal border of the shoulder joint. The nodes are most easily reached from the internal or split surface of the carcass by a transverse cut just in front of the shoulder joint to the cranial border of the pectoral muscle.

In sheep the nodes are located as in cattle. Caseous lymphadenitis may be frequently detected in this node.

In horses the nodes are situated cranial to the shoulder joint at the cranial border of the cleidoscapularis pectoralis muscle.

The afferent vessels come from the skin of the neck, shoulder, part of the ventral and lateral surfaces of the thorax cranial to a line drawn from the thorax to the dorsal extremity of the tenth or twelfth rib, and from the skin and subcutis of the thoracic limb. Afferents also come from the muscles of the shoulder girdle, external scapular muscles, the tendons of the muscles of the forearm and digits, fascia of the forearm, joints of the carpus and digits, and the accessory superficial cervical lymph nodes. The efferent vessels descend over the scalenus muscle and open on the right side in the end of the right tracheal trunk. On the left side, they terminate in the thoracic duct or the left tracheal trunk.

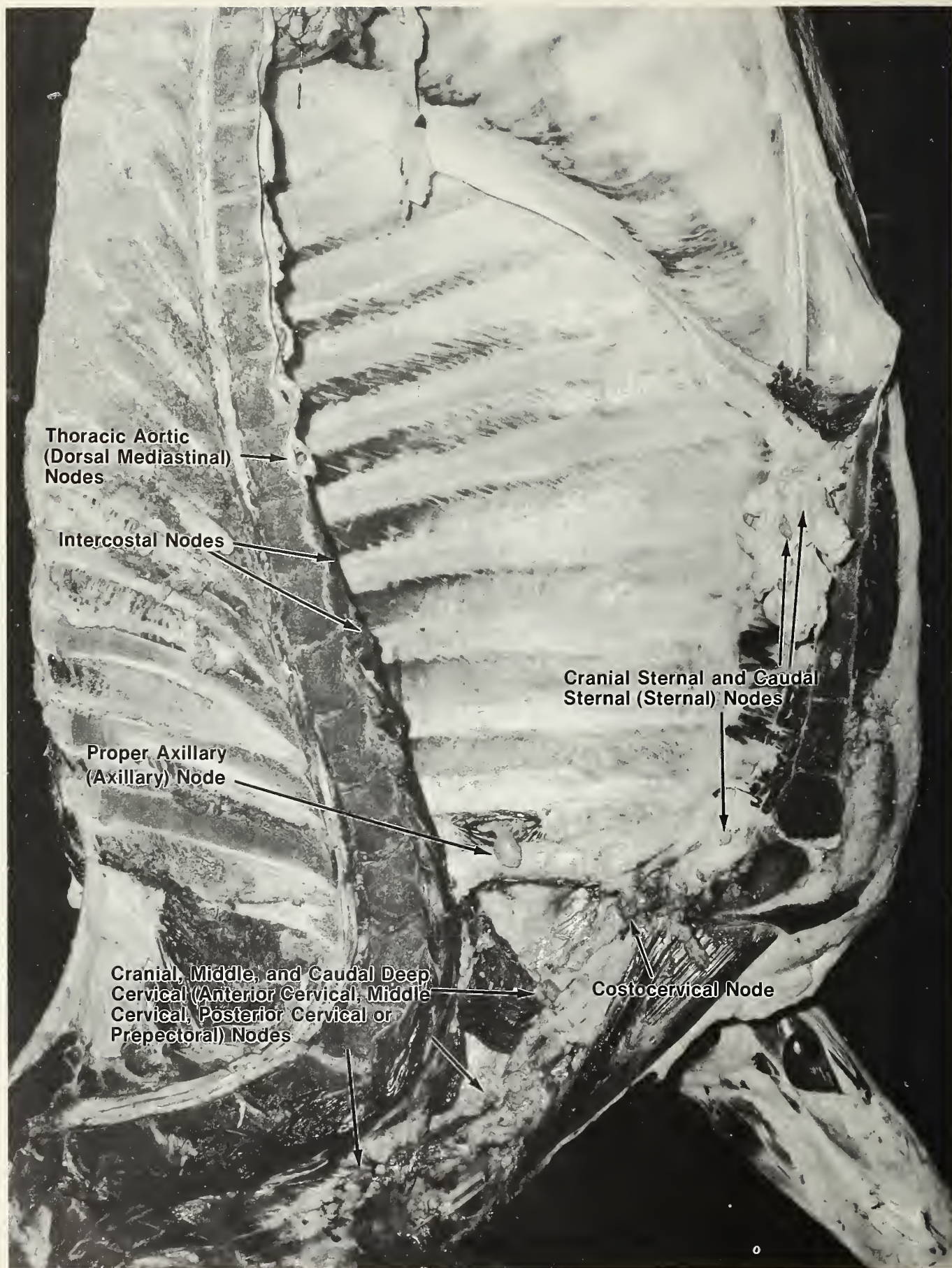


Figure 10

LYMPHOCENTERS OF THE NECK [continued]

The Deep Cervical Lymphocenter - The *cranial deep cervical* (anterior cervical) **lymph nodes** in cattle are situated cranial and caudal to the thyroid along the course of the carotid artery (Figure 10). They are variable in number and size. In hogs these nodes are usually absent. When present, they are located in the region between the larynx and thyroid on the first and second tracheal rings. They have not been described in sheep. In horses they are located craniomedial to the thyroid gland.

The afferent lymph vessels come from the larynx, trachea, thyroid, esophagus, cervical part of the thymus, adjacent muscles of the neck and, occasionally, from the lateral retropharyngeal lymph nodes. The efferent lymph vessels join the tracheal trunks or they pass to the middle cervical lymph nodes.

The *middle deep cervical* (middle cervical) **lymph nodes** in cattle lie on each side of the trachea in the middle third of the neck (Figure 10). They vary in position, number, and size. Usually a number of hemal nodes accompany these lymph nodes. These lymph nodes are usually absent in sheep. In hogs, the nodes are seldom found but are located just dorsal to the thyroid, ventrolateral to the trachea. In horses they are located along the middle portion of the trachea, usually ventral to the common carotid. The afferent vessels come from the trachea, esophagus, thymus, ventral muscles of the neck, and from the cranial deep cervical lymph nodes. Efferent vessels either join the tracheal trunks or they go to the caudal deep cervical lymph nodes.

In cattle, the *caudal deep cervical* (prepectoral or posterior cervical) **lymph nodes** are situated near the thoracic inlet, dorsal and ventral to the common jugular vein (Figure 10). They are between the two jugular veins in sheep. In hogs, these nodes are located caudal to the thyroid, ventral to the trachea, in an angle formed by the common jugular veins. In horses they are located slightly cranial to the first rib along the ventrolateral face of the trachea. The afferent vessels come from the trachea, esophagus, ventral muscles of the neck, thymus, and from the middle deep cervical, axillary, costocervical, and occasionally from the superficial cervical lymph nodes. The efferent vessels terminate in the tracheal trunks, go to the terminal part of the thoracic duct (left side), form common trunks with the efferents of the axillary of the first rib and with the superficial cervical lymph nodes, or empty into the common jugular veins.

LYMPHOCENTERS OF THE NECK [continued]

These nodes are sometimes affected with tuberculosis. In a split beef carcass, these nodes may be reached by inserting a knife into the cut end of the venous trunk and making a downward longitudinal incision parallel to the fibers of the long muscles of the neck where the node may be found embedded in the fatty cushion. In the split hog carcass, these nodes may be exposed by making a transverse incision just cranial to the first rib.

In cattle and sheep the **costocervical lymph node** is found near the origin of the costocervical trunk, dorsal to the carotid (Figure 10). It has not been described in hogs and horses.

LYMPHOCENTER OF THE THORACIC LIMB

The Axillary Lymphocenter - The *proper axillary* (axillary) **lymph nodes** in cattle are located on the medial surface of the internal scapular muscles, 6 to 10 cm caudal to the shoulder joint, and caudal to the subscapular vein. In cattle the node may be easily reached from the inner surface of the split carcass (Figure 10). It lies lateral to the first or second rib (usually the latter), about midway between the two extremities; and by cutting through the muscles along the cranial border of the first rib near its middle, the node may be readily located embedded in a cushion of fat.

One or two lymph nodes may be present in sheep. They occasionally may be absent on one or both sides. They are located on the medial aspect of the teres major muscle, in the angle formed by the subscapular and thoracodorsal vessels.

In horses they form a conglomerate of lymph nodes 4 to 7 cm in length. They are situated on the medial aspect of the teres major muscle at the height of the second intercostal space. The nodes are not described in swine.

The **axillary lymph nodes of the first rib** in hogs form a conglomerate of lymph nodes cranial to the first rib. In cattle they are located on the lateral face of the first rib or in the first intercostal space.

The **axillary lymph nodes of the first rib** in sheep, two or three in number, are found near the axillary vessels. In horses they are difficult to distinguish from the caudal deep cervical nodes.

The afferent vessels come from most of the muscles of the shoulder, arm and forearm, the pectoralis profundus and superficialis, and cutaneous muscles of the shoulder region. Afferents arrive also from the shoulder, elbow, and carpal joints and from the infrapinnous lymph nodes. The efferent lymph vessels pass to the axillary lymph nodes of the first rib or to the caudal deep cervical lymph nodes, or may terminate in the jugular veins.

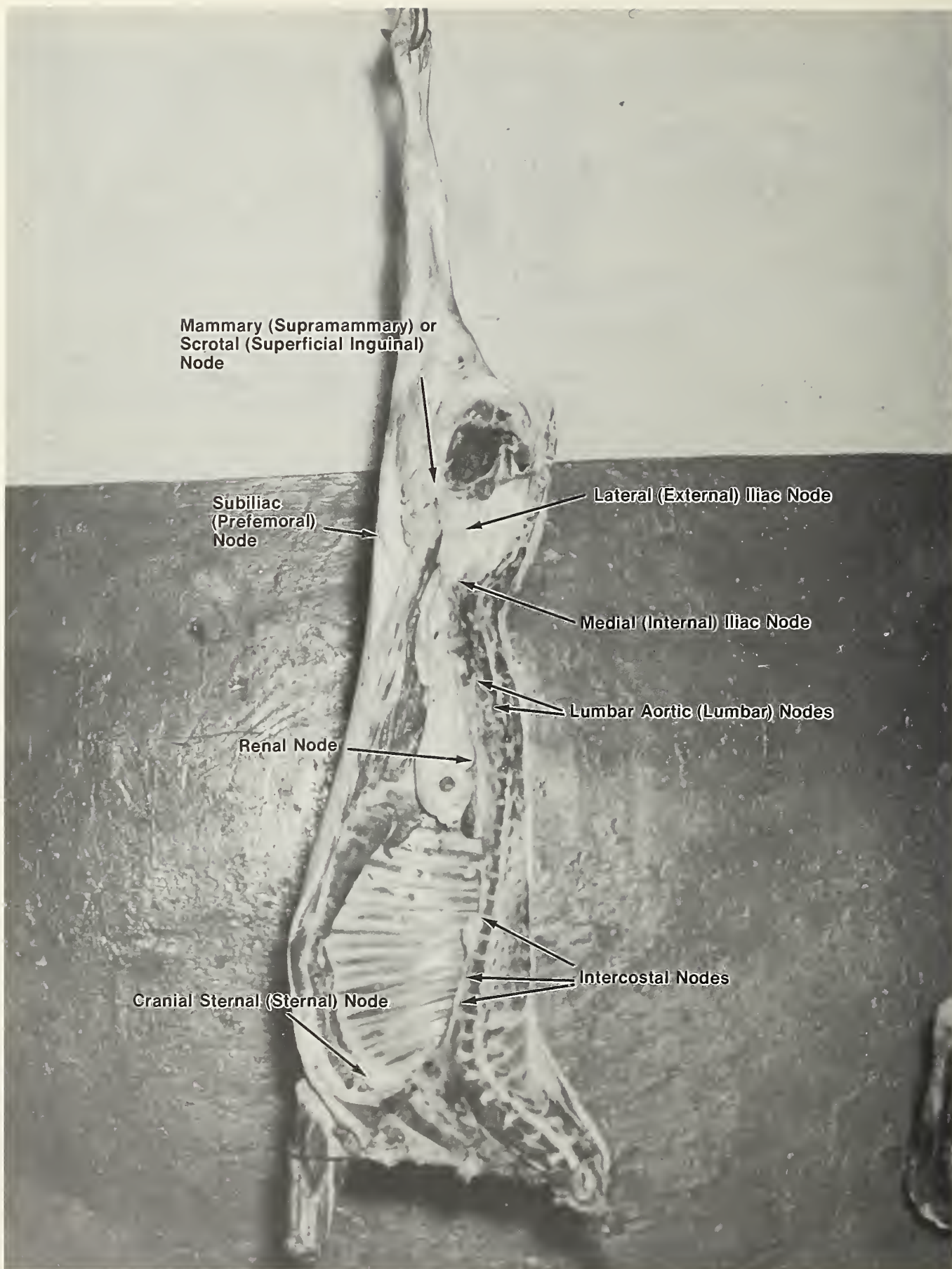


Figure 11

LYMPH NODES OF SHEEP CARCASS, INTERNAL VIEW

LYMPHOCENTERS OF THE THORACIC CAVITY

The Dorsal Thoracic Lymphocenter - The *thoracic aortic* (dorsal mediastinal) *lymph nodes* in cattle are located along the dorsolateral border of the aorta, ventral to the sympathetic trunk (Figure 10). Their number and size vary greatly. In hogs, the nodes are situated in the mediastinum dorsal to the thoracic aorta and caudal to the sixth rib. In sheep and horses they lie along the dorsolateral border of the aorta, embedded in fat.

The afferent vessels come from the muscles of the thoracic wall, diaphragm, pleura and pericardial sac, intercostal lymph nodes and, occasionally, from the spleen. The efferent vessels pass to the thoracic duct, caudal mediastinal lymph nodes and, sometimes, to the left tracheobronchial and middle mediastinal lymph nodes.

In cattle, the *intercostal lymph nodes* are situated dorsal to the sympathetic trunk in the intercostal spaces, along the course of the intercostal vessels, embedded in fat (Figure 10). Not all spaces contain lymph nodes and, sometimes, two nodes may occur in one space. In hogs, these nodes are absent.

In sheep one small node lies at the dorsal end of each intercostal space (Figure 11).

In horses the nodes are located in the intercostal spaces, near the head of the ribs, dorsal to the sympathetic trunk (Figure 12).

The afferent vessels come from the intercostal and spinal muscles, the latissimus dorsi, trapezius, subscapularis, longus colli and obliquus externus abdominis muscles, and from the costal pleura, ribs, and peritoneum. The efferent vessels go to the thoracic aortic lymph nodes or they empty into the thoracic duct or pass to the cranial mediastinal lymph nodes.

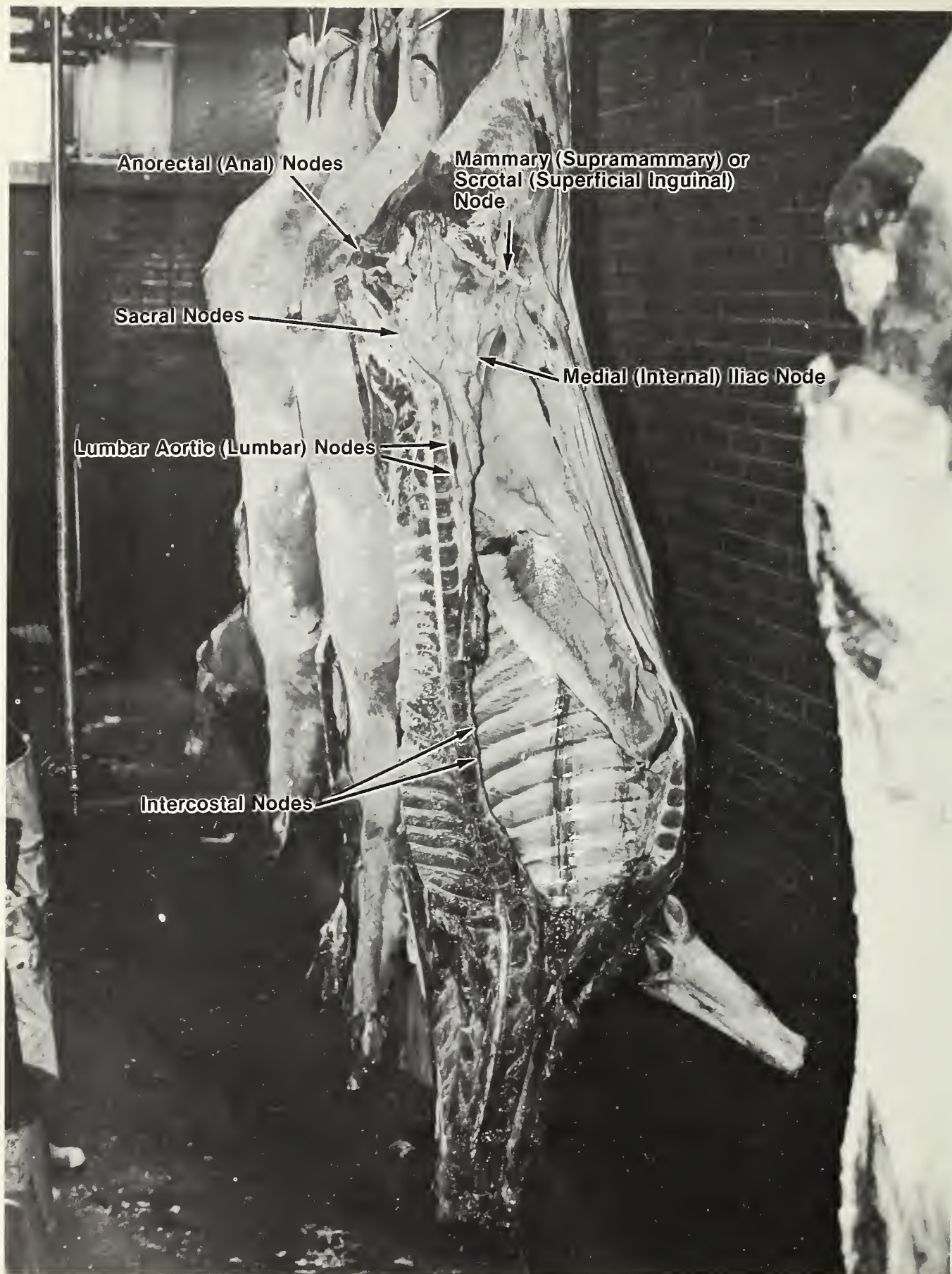


Figure 12

LYMPHOCENTERS OF THE THORACIC CAVITY [continued]

The Ventral Thoracic Lymphocenter - The *cranial sternal lymph nodes* are situated along the course of the internal thoracic vessels (Figure 10). Usually in cattle there is only one lymph node, 1.5 to 2.5 cm in size, located in the first intercostal space cranial to the transversus thoracis muscle, embedded in fat. In hogs, they are situated ventral to the cranial vena cava in association with the internal thoracic vessels on the manubrium of the sternum (Figure 13).

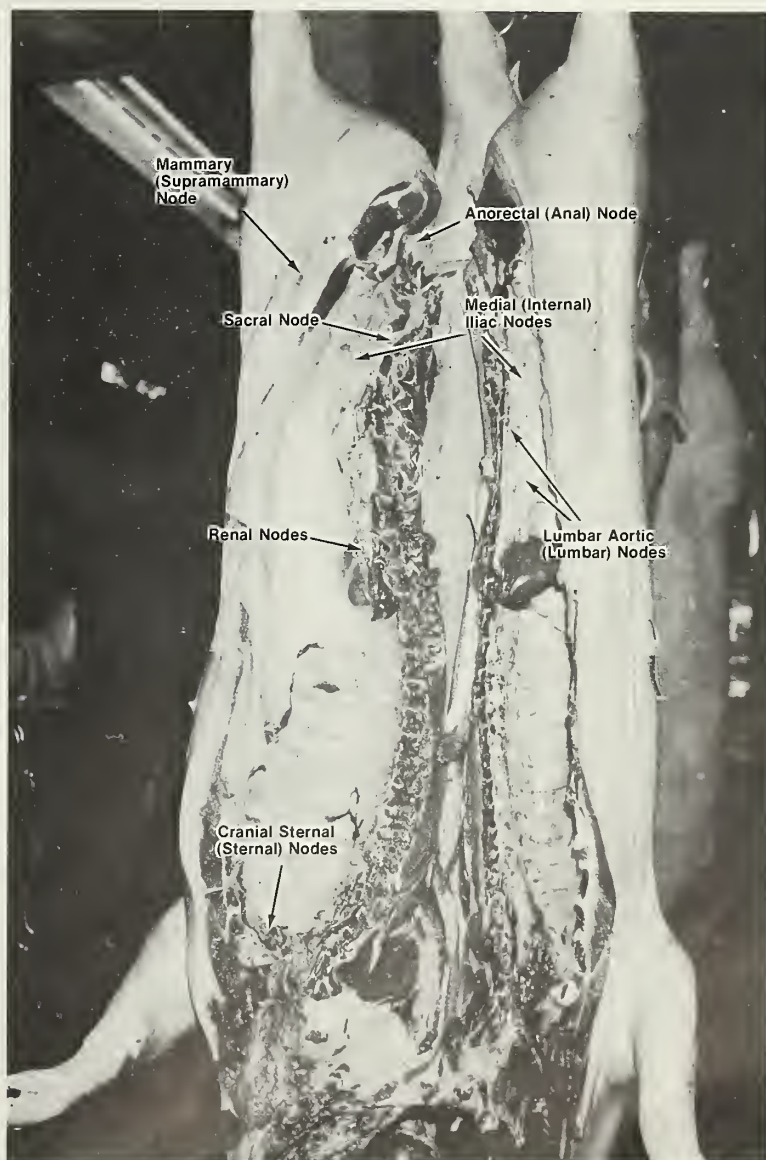


Figure 13

LYMPH NODES OF HOG
CARCASS, INTERNAL VIEW

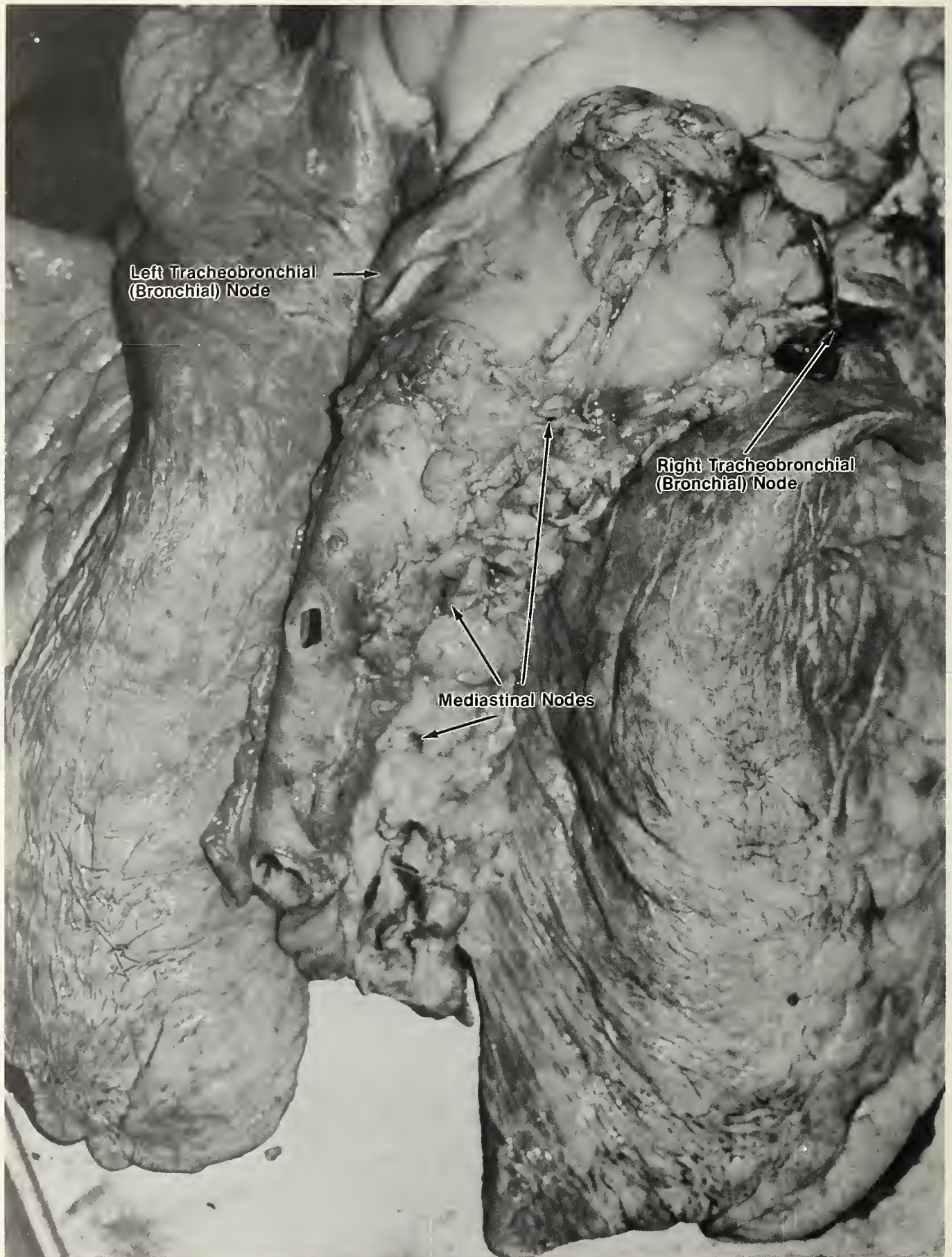


Figure 14

LYMPHOCENTERS OF THE THORACIC CAVITY [continued]

In sheep they are similar to cattle. In horses they are located near the origin of the internal thoracic vessels.

The afferent vessels are received from muscles of the ventral and lateral thoracic wall, abdominal muscles, diaphragm, costal pleura of the ventral portion of the thorax, pericardial sac, liver, and the caudal sternal lymph nodes. The efferent vessels go to the cranial mediastinal lymph nodes, the thoracic duct, and the tracheal trunks.

The **caudal sternal lymph nodes** in cattle are covered by the transversus thoracis muscle and vary in size, number, and arrangement (Figure 10). One of the lymph nodes is often situated in the angle between the eighth and ninth costal cartilages and sternum and may escape notice.

In sheep they are one to three in number. In horses they are inconstantly found caudal to the transversus thoracis on the sternum.

The afferent vessels come from the diaphragm; the intercostal, pectoralis profundus, serratus ventralis, rectus thoracis, and abdominal muscles; the costal and caudal mediastinal pleura; the pericardium; the peritoneum; the liver; the ribs; and the sternum. The efferent vessels conjoin to form one or two larger sized lymph vessels which run cranial to the cranial sternal lymph nodes.

The Mediastinal Lymphocenter - The **cranial mediastinal** (anterior mediastinal) **lymph nodes** are found in the cranial mediastinum in association with the large blood vessels, trachea, and esophagus (Figure 14). They vary in size, number, and arrangement with a variable number of hemal nodes present in their vicinity. In hogs, these nodes are located in the precardial mediastinum. Usually these lymph nodes are associated with the trachea, the esophagus, and the large blood vessels in this region, and they are often not clearly distinguishable from the sternal lymph nodes cranially and from the tracheobronchial lymph nodes caudally.

In sheep they are similar to cattle with two or three present. In horses their number and size vary. They are located in the precardial mediastinum in association with the cranial vena cava and common brachiocephalic trunk.

LYMPHOCENTERS OF THE THORACIC CAVITY [continued]

The afferent vessels come from the thoracic portion of the esophagus, trachea, thymus, lungs, pericardium, heart, costal and mediastinal pleura, and the intercostal and thoracic aortic lymph nodes. Afferents may also come from the cranial sternal and the left and cranial tracheobronchial lymph nodes. The efferent vessels pass to the thoracic duct (left side), the tracheal trunks, or the costocervical lymph nodes.

The ***middle mediastinal lymph nodes*** are situated on the right or dorsal to the aortic arch and may extend to the right face of the esophagus (Figure 14). Often they may not be clearly distinguishable from the cranial and caudal mediastinal lymph nodes. In hogs, these nodes do not exist. In horses they constitute a small group of lymph nodes located dorsal to the heart on the right side of the esophagus and trachea.

The afferent lymph vessels are received from the esophagus, trachea, lungs, mediastinum, and the intercostal and right tracheobronchial lymph nodes. The efferent lymph vessels pass to the thoracic duct or the cranial mediastinal lymph nodes.

The ***caudal mediastinal*** (posterior mediastinal) ***lymph nodes*** are situated in the caudal mediastinum caudal to the aortic arch, ventral to the aorta along the dorsal and lateral faces of the esophagus (Figure 14). Often one of the nodes appears to be 5 to 10 cm in length, extending to the diaphragm. This node is accompanied by several small nodes 1 to 4 cm in length. In hogs, these nodes are occasionally found situated caudal to the aortic arch and along the esophagus.

In sheep two long lymph nodes are present. In horses usually only a few lymph nodes are found, and occasionally they may not be clearly distinguishable from the middle mediastinal nodes.

The afferent vessels come from the esophagus, lungs, pericardial sac, diaphragm, mediastinum, peritoneum, liver and spleen, and the phrenic, left tracheobronchial, pulmonary and, sometimes, from the thoracic aortic lymph nodes. The efferent vessels unite to form a trunk which joins the thoracic duct.

LYMPHOCENTERS OF THE THORACIC CAVITY [continued]

The Bronchial Lymphocenter - The *left tracheobronchial* (left bronchial) *lymph node* is situated in the angle between the aortic arch and the left division of the pulmonary artery and is crossed laterally by the left azygos vein (Figure 14). This node is normally the largest in the bronchial lymphocenter. In sheep one or two are present. In hogs, these nodes are usually found in pairs cranial to the left apical bronchus on the left side of the trachea and medial to the left azygos vein (Figure 15). In horses they form an elongated conglomeration of nodes on the left ventrolateral aspect of the trachea extending to near the aortic arch.

The afferent vessels come from the lung, esophagus, and heart and the pulmonary and thoracic aortic lymph nodes. The efferent vessels join the efferent vessels of the caudal mediastinal lymph nodes or they may empty into the thoracic duct.

The left tracheobronchial lymph node of cattle is examined by grasping the cranial lobe of the left lung with one hand and incising across the left bronchus at the root of the lobe to cut and expose the lymph node.

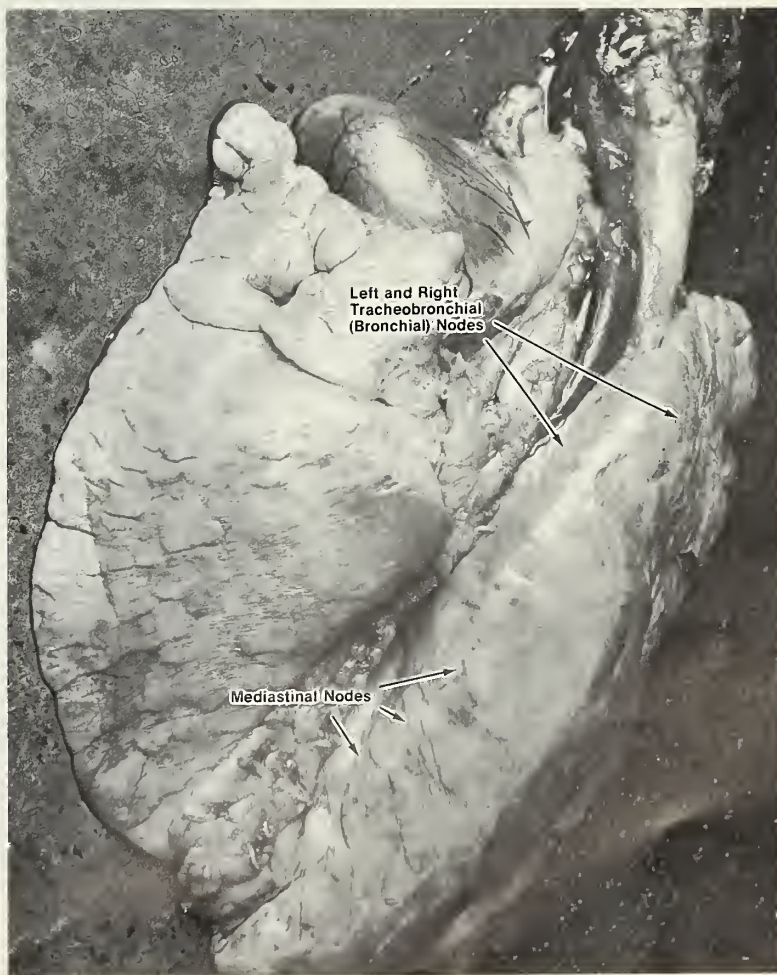


Figure 15

THORACIC VISCERA OF SWINE
(LEFT APICAL LOBE OF LUNG
IS REMOVED)

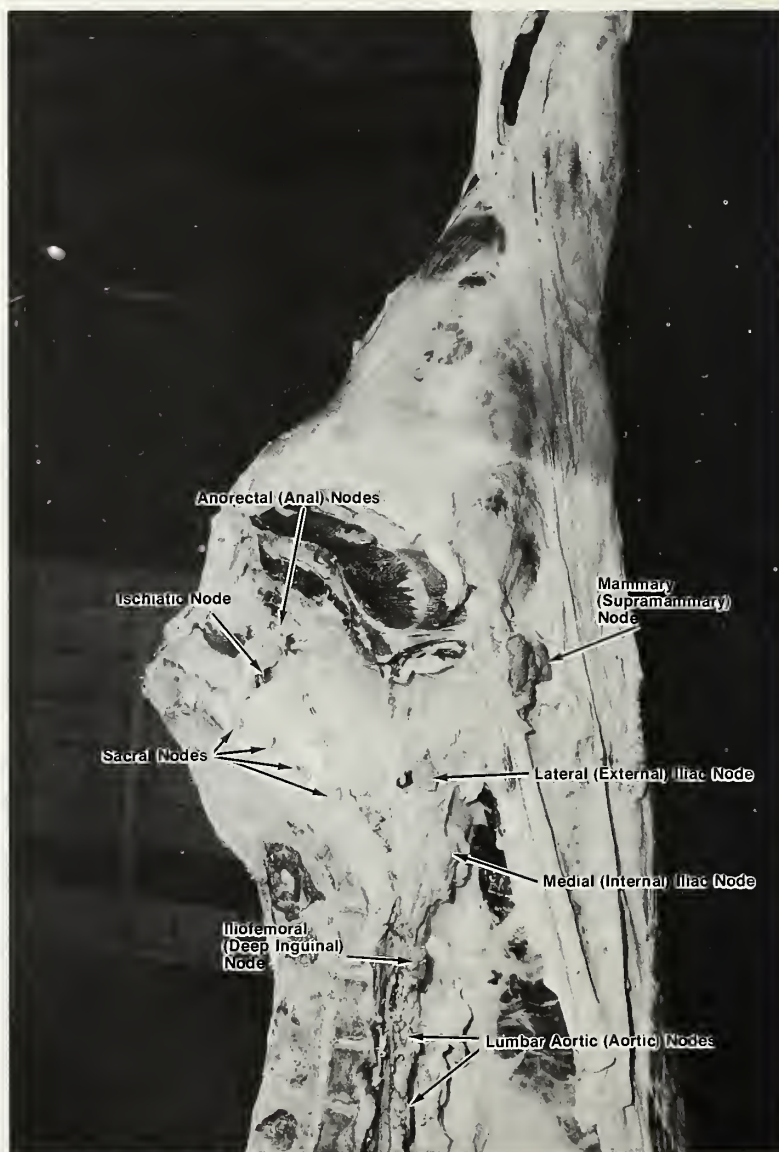
LYMPHOCENTERS OF THE THORACIC CAVITY [continued]

The **right tracheobronchial** (right bronchial) **lymph node** is located on the right side of the bifurcation of the trachea, near the dorsal border of the right branch of the pulmonary artery. It is present in about 25 percent of the carcasses. In hogs, these nodes are found on the right side of the trachea between the apical and middle bronchi. In horses they form a conglomeration of 4 to 6 lymph nodes, 0.5 to 5.0 cm in size. They are located cranial to the apical bronchus on the right lateral and dorsolateral sides of the trachea.

The afferent vessels are received from the lungs and the pulmonary and middle tracheobronchial lymph nodes. The efferent vessels lead to the middle mediastinal lymph nodes.

Figure 16

LYMPH NODES OF CATTLE HINDQUARTER, INTERNAL VIEW



LYMPHOCENTERS OF THE ABDOMINAL AND PELVIC WALL

The Lumbar Lymphocenter - The *lumbar aortic* (lumbar) **lymph nodes** are located along the abdominal aorta and the caudal vena cava in the region extending from the last thoracic vertebra to the last lumbar vertebra (Figure 16). In hogs and horses, these nodes are scattered along the ventral and lateral sides of the abdominal aorta and the caudal vena cava. Cranially, these nodes are often not clearly distinguishable from the renal lymph nodes, and caudally, it may be difficult to differentiate them from the medial iliac lymph nodes. In sheep they are not clearly distinguishable from the medial iliac lymph nodes.

The afferent vessels come from the muscles and fasciae of the lumbar region, the kidneys, peritoneum, and the proper lumbar and medial iliac lymph nodes. The efferent vessels terminate in the lumbar trunks or pass to the cisterna chyli.

The *renal lymph nodes* are found along the renal vessels and vary in number and size. Often they are not clearly distinguishable from the lumbar aortic lymph nodes in cattle. In hogs and horses, the lymph nodes are found in association with the renal vessels. They also are difficult to distinguish from the lumbar aortic lymph nodes. In sheep there are one or two lymph nodes on each side (Figure 11).

The afferent vessels are received from the kidneys and the adrenal glands. The efferent vessels go to the cisterna chyli, join the intestinal or the lumbar trunks, or pass first into the lumbar aortic lymph nodes.

The Iliosacral Lymphocenter - In cattle the *medial iliac* (internal iliac) **lymph nodes** are situated cranial and caudal to the origin of the deep circumflex iliac vessels (Figure 16). The cranial portion of this lymph node group is not clearly distinguishable from the lumbar aortic lymph nodes. Some of the lymph nodes are located in the space between the external and internal iliac vessels and it is often not possible to distinguish them from the sacral lymph nodes. The lymph nodes caudal to the deep circumflex iliac vessels are commonly larger (5.0 to 7.5 cm in length). In hogs and horses (Figures 12 and 13), the nodes are located cranial and caudal to the origin of the deep circumflex iliac artery along the lateral and medial aspects of the external iliac vessels. Cranially, the nodes are often not clearly distinguishable from the lumbar aortic lymph nodes. In sheep their location is similar to cattle (Figure 11).

LYMPHOCENTERS OF THE ABDOMINAL AND PELVIC WALL [continued]

The afferent lymph vessels come from the muscles of the lumbar and pelvic regions, the caudal half of the abdominal wall and the pelvic limb, the bones of the pelvic limb (except the digits), the hip, stifle and tarsal joints, the urogenital organs, the peritoneum, the lateral iliac, the sacral and internal iliac lymph nodes, and the mesenteric, iliofemoral, inguinofemoral, ischiatic, and popliteal lymphocenters. The efferent lymph vessels form the lumbar trunks which terminate in the cisterna chyli.

In the hanging beef carcass, this node may be felt by placing the hand on the medial surface of the ilium at about the dorsal third of the border of the pelvic arch.

In cattle the **lateral iliac** (external iliac) **lymph nodes** are found at the bifurcation of the deep circumflex iliac vessels (Figure 16). In the majority of cases, a single lymph node is found just cranial to the origin of the cranial branch of the artery, but another may lie in the angle between the two branches. The more constant one is 1.0 to 2.5 cm in diameter. They may be absent on one side, but rarely on both sides. In hogs, these lymph nodes are located cranial to the cranial branches of the deep circumflex iliac vessels. In sheep these nodes are absent in most cases. In horses there are usually 4 to 20 small lymph nodes located at the origin of the cranial and ventral branches of the deep circumflex iliac vessels.

The afferent vessels come from the abdominal muscles, the gluteus profundus, tensor fasciae latae muscle and fascia lata, the peritoneum of the adjacent region, the pelvic bones, and also from the subiliac, coxal, accessory coxal, and paralumbar fossa lymph nodes. The efferent vessels go to the medial iliac lymph nodes, terminate in the lumbar trunks, or pass first to the lumbar aortic lymph nodes.

The **sacral lymph nodes** are located in the angle formed by the internal iliac arteries, near the origin of the medial sacral artery (Figure 16). This group of nodes is not clearly distinguishable from the medial iliac lymph nodes. In hogs and horses, these nodes are located in the same position as ruminants.

The afferent vessels are received from muscles of the tail and pelvic region, the uterus, vagina, vestibule of the vagina, vulva, urethra, prostate gland and vesicular glands, internal iliac lymph nodes, and ischiatic lymphocenter. The efferent vessels pass to the medial iliac lymph nodes.

LYMPHOCENTERS OF THE ABDOMINAL AND PELVIC WALL [continued]

The **anorectal** (anal) **lymph nodes** are situated along the dorsal and lateral surfaces of the retroperitoneal portion of the rectum in cattle and sheep (Figure 16). There are many small hemal nodes found in relation to these nodes in cattle. In hogs and horses, these lymph nodes are found in the same location as ruminants. Occasionally, these nodes may be absent.

The afferent vessels come from the anus, rectum, and terminal part of the colon. The efferents go to other lymph nodes of the same group, then unite to form large vessel trunks and terminate in the medial iliac lymph nodes.

The Inguinofemoral Lymphocenter (Superficial Inguinal) - The **superficial inguinal lymph nodes** are referred to as the **mammary** (supramammary) **lymph nodes** in the female. They are located above the caudal border of the base of the udder in cattle and sheep (Figure 16). The size may vary from 6 to 10 cm in length. In hogs, these nodes are found ventral to cranial branches of the external pudendal vessels along the lateral and caudal borders of the caudal half of the last mammary gland. In horses they may extend to the ventral portion of the pelvic wall and the lateral face of the udder.

The afferent vessels are received from the udder, vulva, vestibule of the vagina, clitoris, the skin of the medial and caudal aspects of the thigh, and the medial surface of the leg. The efferents go to the medial iliac lymph nodes.

In the male the superficial inguinal lymph nodes are referred to as **scrotal lymph nodes**. They are situated below the prepubic tendon and lie in the mass of fat around the neck of the scrotum. They vary in number from one to several on each side of the penis and the size varies from 3 to 6 cm in length. In hogs the scrotal lymph nodes are located on the ventral side of the abdominal wall, lateral to the penis. They are associated mainly with the cranial branches of the external pudendal vessels, which they cover ventrally. In sheep they are one or three in number. In horses there are usually two conglomerations of nodes embedded in fatty connective tissue.

The afferent vessels come from the scrotum, prepuce, and penis, including the muscles associated with the penis, and also from the skin of the medial and caudal surfaces of the thigh and the medial aspect of the leg. The efferent vessels follow the external pudendal vessels and terminate in the medial iliac lymph nodes.

LYMPHOCENTERS OF THE ABDOMINAL AND PELVIC WALL [continued]

The **subiliac** (prefemoral) **lymph nodes** are located on the aponeurosis of the obliquus externus abdominis muscle, in contact with, or close to, the tensor fasciae latae muscle and approximately 12 to 15 cm dorsal to the patella (Figure 17). The node has an elongated outline and is usually flattened with an average length of 8 to 10 cm and width of 2.5 cm.

In some cases, a small lymph node may be found dorsal or ventral to the large one. In hogs and horses the subiliac lymph nodes form a large, elongated conglomerate of small lymph nodes on the midline between the coxal tuber and patella and are situated cranial to the tensor fasciae latae muscle, embedded in fatty subcutaneous tissue along the ventral branches of the deep circumflex iliac vessels. In sheep, usually a single lymph node is present.

The afferent lymph vessels are received from the skin of the pelvic, thigh, and leg regions, and from the abdomen and caudal portion of the thorax. Vessels also come from the prepuce, tensor fasciae latae muscle, coxal and accessory coxal lymph nodes, and lymph nodes of the paralumbar fossa. The efferent lymph vessels ascend on the deep face of the tensor fasciae latae and end chiefly in the iliac nodes.

In the hog, the node can be found with little mutilation of the carcass by making an incision through the inner abdominal wall nearly perpendicular to the vertebral column and craniodorsal to the femorotibial articulation.

In cattle, the node can be reached from the external surface of the carcass in the region known to the butcher as the "fell" by cutting down more deeply than is done by the butcher in dressing the carcass, or by making a longitudinal incision into the "fell" along the cranial border of the tensor fasciae latae.

The Ischiatic Lymphocenter - The **ischiatic lymph nodes** in cattle and hogs are located on the lateral face of the broad sacrotuberal ligament. The nodes are near the greater ischiatic incisure, medial to the gluteus medius muscle in association with the ischiatic nerve and the cranial gluteal vessels (Figure 16). These nodes may be absent. They are absent in sheep. In horses they form a small group of lymph nodes on the lateral side of the sacrotuberal ligament.

LYMPHOCENTERS OF THE ABDOMINAL AND PELVIC WALL [continued]

The afferent vessels arrive from the skin and muscles of the pelvic and thigh regions, from the hip joint, anus, rectum, vulva, prostate gland, crurae of the penis, and the popliteal and tuberal lymph nodes. The efferent vessels go to the medial iliac and sacral lymph nodes.

This node may be found by making a transverse incision through the sacrotuberal ligament adjacent to the lesser sciatic incisure.



Figure 17

**LOCATION OF SUBILIAC
(PREFEMORAL) NODE IN COW**

LYMPHOCENTERS OF THE PELVIC LIMB

The Iliofemoral Lymphocenter (Deep Inguinal) - The **iliofemoral lymph node** is located in the region of the deep femoral artery, near the origin of the pudendoepigastric trunk (Figure 16). There are one or two present, approximately 1.0 to 2.5 cm in size. In most cases, they are absent on one or both sides. In hogs, the nodes are located in the same location as in ruminants, but usually are absent. They are usually absent in sheep. In horses they are located in the proximal part of the femoral canal between the pectineus and sartorius muscles.

The afferent vessels are not well established. The efferent vessels pass to the medial iliac lymph nodes.

The Popliteal Lymphocenter - In cattle and horses, the **superficial popliteal lymph nodes** are absent. In hogs, these superficial nodes are located on the dorsocaudal surface of the gastrocnemius muscle, in a groove between the biceps femoris and the semitendinosus muscles.

The afferent vessels come from the skin and subcutis of the caudolateral and plantar areas of the leg, distal to the tarsus; the subcutis of the bulbs and claws; the dorsal surface of the digits; the leg distal to the tarsus; and the muscles, tendons, ligaments and joint capsules of the tarsus and digits. The efferent vessels pass to the deep popliteal and medial iliac lymph nodes, as well as to the gluteal and ischiatic lymph nodes.

The **deep popliteal** (popliteal) **lymph nodes** are situated deeply in a mass of fat on the gastrocnemius muscle between the biceps femoris and semitendinosus muscles in cattle and horses (Figure 18). Their average length in both of these species is 3 to 4 cm with a width of around 2 to 3 cm. In hogs, the deep popliteal lymph nodes are found approximately 3 to 6 cm craniodorsal to the superficial nodes on the gastrocnemius muscle between the biceps femoris and semitendinosus muscles. There may be two or three small lymph nodes but in half the cases, the nodes are absent. In sheep the popliteal nodes are located approximately 2.5 cm deep, embedded in fat, between the biceps femoris and the semitendinosus muscles.

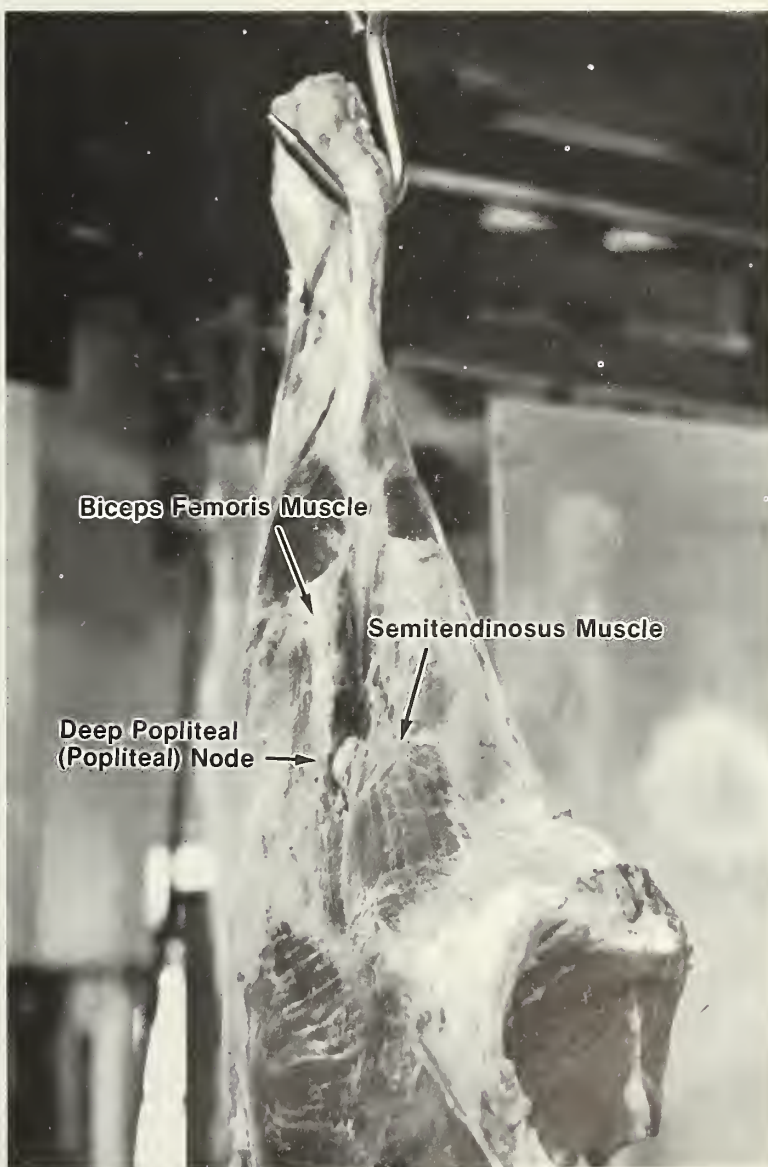
LYMPHOCENTERS OF THE PELVIC LIMB [continued]

The afferent vessels come from the skin of the lateral and caudal portions of the leg and from the distal part of the limb, from the biceps femoris and semitendinosus muscles, and from all muscles, joints, and tendons distal to the location of the lymph node. The efferent vessels pass to the medial iliac, sacral, and ischiatic lymph nodes.

To reach these nodes in a cattle carcass, make a deep incision on the caudal part of the thigh, parallel to the muscle fibers between the biceps femoris and the semitendinosus muscles, on a line from the point of the ischium to the point of the os calcis, at the intersection of a horizontal line drawn backward from the patella. The nodes may then be found between the muscles on a cushion of fat at the bifurcation of the gastrocnemius.

Figure 18

DEEP POPLITEAL NODE OF COW
SEVERED FROM ITS ATTACHMENTS
AND BROUGHT TO SURFACE



LYMPHOCENTERS OF THE ABDOMINAL VISCERA

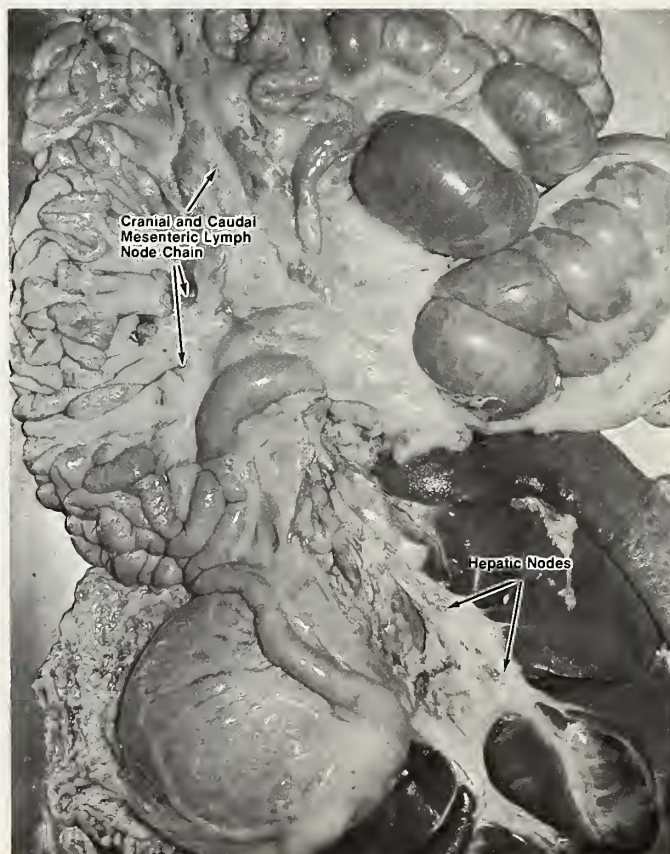
Figure 19

LYMPH NODES
OF BOVINE LIVER



Figure 20

ABDOMINAL VISCERA
OF SWINE



LYMPHOCENTERS OF THE ABDOMINAL VISCERA [continued]

The Celiac Lymphocenter - The *gastric lymph nodes* are numerous and often difficult to group satisfactorily. In cattle and sheep, they comprise the following nodes. The atrial lymph nodes lie on the visceral surface of the atrium just caudal to the cardia. The right, left, and cranial ruminal lymph nodes are grouped according to their location on the rumen. The reticular lymph nodes are found on the reticulum, dorsal and ventral to their junction with the omasum. The omasial lymph nodes lie on the omasum along the left gastric vessels. The dorsal and ventral abomasial lymph nodes are found along the lesser and greater curvatures of the abomasum. The ruminoabomasial and reticuloabomasial lymph nodes are found around the different parts of the stomach. In hogs, the gastric lymph nodes are situated at the cardia of the stomach along the right gastric artery.

In horses their number and size vary greatly. They are mainly situated along the course of the left gastric artery.

The afferent vessels are received from the various parts of the stomach. The efferent vessels eventually terminate in the cisterna chyli.

The *hepatic or portal nodes*, from three to five in number, are located in cattle on the posterior surface of the liver and are embedded in the fatty cushion surrounding the vessels entering at the portal fissure (Figure 19). In hogs (Figure 20) and sheep they are grouped around the portal vein. In horses they lie along the portal vein and hepatic artery, varying in size and number.

Afferent lymph vessels come from the liver, pancreas, duodenum, and the ventral abomasal lymph nodes. Their efferent lymph vessels converge into a large trunk that passes along the portal vein and joins the common efferent vessels of the intestinal lymph nodes or terminates in the gastric lymph trunk.

The *splenic lymph nodes* in hogs are located in the gastrosplenic omentum at the hilus of the spleen. In horses they are found associated with the splenic vessels. Their size and number vary. They are not described in cattle and sheep.

The afferent vessels come from the spleen, pancreas, stomach, and omentum. Efferents go to the celiac lymph nodes or terminate in the celiac lymph trunk.

LYMPHOCENTERS OF THE ABDOMINAL VISCERA [continued]

The **celiac lymph nodes** in cattle and sheep are located dorsal to the pancreas at the origin of the celiac artery. Afferent vessels come from the spleen with the efferent vessels joining the gastric, celiac, or visceral lymph trunk.

In horses and hogs they are situated at the origin of the celiac artery, which they surround.

The Cranial Mesenteric Lymphocenter - The **cranial mesenteric lymph nodes** are situated at the origin of the cranial mesenteric artery (Figure 21). The jejunal lymph nodes are located in the mesentery of the jejunum and ileum and throughout the coils of the colon. The cecal lymph nodes are situated on the right side of the spiral mass of the ascending colon and between the coils. In hogs, these nodes can be found in very similar locations along the mesentery structure of the viscera (Figure 20).

In horses they are situated at the origin of the cranial mesenteric artery. Their number and size vary greatly.

The afferent vessels are received from the celiac and atrial lymph nodes, spleen, jejunum and ileum, cecum and ascending colon. The efferent vessels join either the gastric or intestinal lymph trunks or terminate in the cisterna chyli.

The Caudal Mesenteric Lymphocenter - The **caudal mesenteric lymph nodes** are situated within the mesentery of the descending colon and rectum and are associated with the branches of the caudal mesenteric artery (Figure 21). These nodes are located similarly in hogs. There are two or three nodes located near the origin of the caudal mesenteric artery and a few small nodes in the descending colon in sheep.

In horses and sheep the caudal mesenteric nodes include the lymph nodes associated with the caudal mesenteric artery.

The afferent lymph vessels arrive from the descending colon, rectum, and also from the anorectal lymph nodes. The efferent lymph vessels go to the medial iliac lymph nodes.

During routine postmortem inspection of cattle, sheep, and horses, the chain of mesenteric lymph nodes is observed for abnormalities along with the viscera. In swine it is also necessary to palpate the nodes because, in a number of cases, these nodes are affected with TB lesions when no other lesions can be found in the carcass.

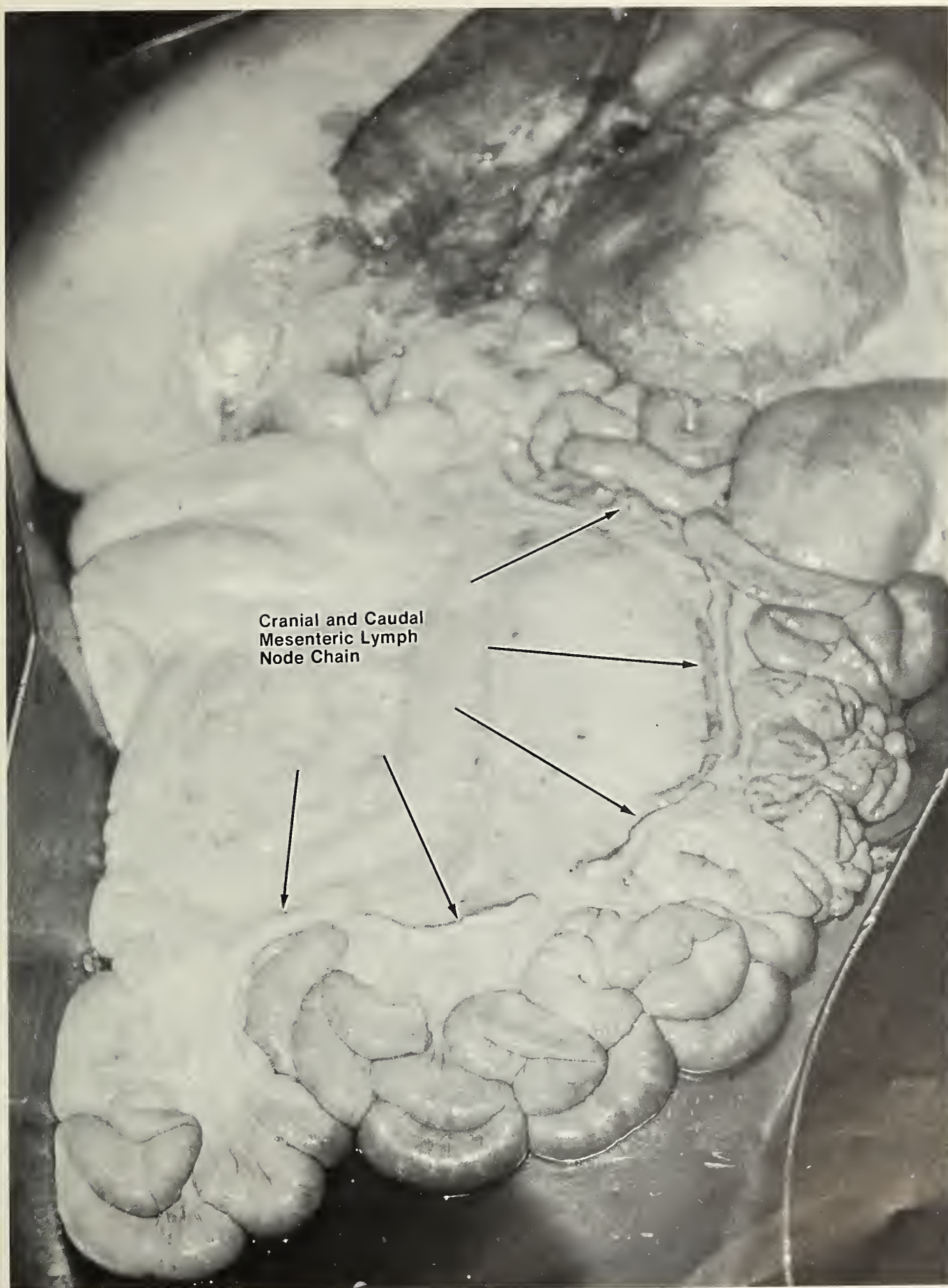


Figure 21

LARGE LYMPH TRUNKS AND DUCTS

The **tracheal trunks** are the efferent lymph vessels of the lateral retropharyngeal lymph nodes. These vessels unite to form one and perhaps two tracheal trunks that course on the lateral aspect of the trachea. The left tracheal trunk may form a common trunk with the thoracic duct, may open in the left common jugular vein, or may branch and empty in the thoracic duct and common jugular vein. The right tracheal trunk terminates in the right common jugular vein.

The **right lymphatic duct** is a common trunk formed by the efferent vessels of the superficial cervical lymph nodes with the right tracheal trunk.

The **lumbar trunks** are found on the ventral surface of the caudal vena cava and the abdominal aorta. They are formed by the efferent vessels of the medial iliac lymph nodes and terminate in the cisterna chyli.

The **hepatic trunk** is formed by the efferent vessels of the hepatic and accessory hepatic lymph nodes. It usually joins the gastric trunk to form the celiac trunk.

The **gastric trunk** is formed by the larger efferent vessels of the atrial lymph nodes which join with the hepatic trunk to form the celiac trunk.

The **celiac trunk** is formed by the union of the hepatic and gastric trunks. The celiac and the intestinal trunks form the visceral trunk.

The **intestinal trunk** is formed by the union of the jejunal and colic trunks. This trunk joins with the celiac trunk to form the visceral trunk.

The **jejunal trunk** is formed by the efferent vessels of the jejunal lymph nodes and terminates in the intestinal trunk.

The **colic trunk** is formed by the larger efferent lymph vessels of the right colic lymph nodes. It joins the intestinal trunk.

The **visceral trunk** is found caudal to the liver in the area of the cranial mesenteric artery at the ventral border of the caudal vena cava. It is formed by the union of the celiac and intestinal trunks. Often this trunk may branch and some of the branches may enter the cisterna chyli.

LARGE LYMPH TRUNKS AND DUCTS [continued]

The *cisterna chyli* is found dorsal to the abdominal aorta and ventral to the last thoracic vertebra and the first or second lumbar vertebra. It receives the lumbar and visceral trunks. Cranially, the cisterna chyli penetrates the aortic hiatus along the dorsal border of the aorta and continues as the thoracic duct.

The *thoracic duct* arises from the cisterna chyli. It may divide into two branches, which lie on the right and left sides of the dorsal face of the thoracic aorta. They unite about the fifth thoracic vertebra where the vessel courses on the left side of the trachea and esophagus cranioventrally by forming an S-like curve. It terminates in the cranial vena cava or in the left common jugular vein.

OTHER LYMPHATIC STRUCTURES

Besides the lymphatic structures already mentioned, there are many lymphatic tissues throughout the carcass. Some of the organs contain lymphatic cellular aggregations, but they are not classed as lymph nodes.

The **spleen** contains organized lymphoid masses which can be seen as white pulp in the splenic tissue when the organ is sectioned.

The **thymus** is a well-developed organ that is very active during late prenatal and early postnatal life. After animals become sexually mature, the organ undergoes marked involution but never completely ceases to exist. The aggregates of thymocytes seen in the thymus are the result of lymphocytes infiltrating the tissue.

In the intestinal tract, the lymphatic tissues are composed of solitary lymph nodes which may unite to form aggregated lymph nodes surrounded by a thin connective tissue capsule called **Peyer's patches**. The extent of Peyer's patches varies greatly between different species and individuals of the same species.

Tonsils are an aggregation of lymphatic tissue in the mouth (root of the tongue, soft palate, and pharyngeal regions) surrounded by a connective tissue capsule. Tonsils have only efferent lymph vessels.

Diffuse lymphatic tissue is located throughout different body systems. The extent and amount of diffuse tissue varies according to the age of the animal, antigenic "activation" of the lymphocytes, and pathological conditions.

LIST OF CATTLE LYMPH NODES

Here is a list of the cattle lymph nodes listed in the guideline and their location using common anatomical landmarks:

<i>Name of Node</i>	<i>Location of Node</i>
Mandibular	In mandibular space about 5 cm cranial to angle of mandible
Parotid	In front of and just below external meatus of ear
Medial Retropharyngeal	Dorsal to pharynx close to mid-line
Lateral Retropharyngeal	Ventral to wing of atlas
Superficial Cervical	Above shoulder joint covered by brachiocephalicus muscle
Cranial Deep Cervical	Cranial third of neck on common carotid artery
Middle Deep Cervical	Middle third of neck on common carotid artery
Caudal Deep Cervical	At entrance to thorax on each side of trachea
Costocervical	Dorsal to carotid near origin of costocervical trunk
Proper Axillary	On medial side of shoulder near brachial plexus
Thoracic Aortic	Dorsal to aorta, ventral to sympathetic trunk
Intercostal	Between ribs near thoracic vertebrae
Sternal	Dorsal surface of sternum on course of internal thoracic vessels
Mediastinal	In the mediastinum
Tracheobronchial	On trachea near branching of main bronchi
Lumbar Aortic	Sublumbar region along abdominal aorta
Renal	At hilus of kidney on renal artery
Medial Iliac	At bifurcation of circumflex iliac artery
Sacral	Ventral surface of sacrum
Anorectal	Lateral wall of pelvis
Mammary	Above posterior part of udder
Scrotal	In front of external inguinal ring
Subiliac	12-15 cm dorsal to the patella on the obliquus externus abdominis muscle
Ischiatic	At lesser sciatic notch of pelvis
Iliofemoral	Where circumflex iliac artery leaves external iliac artery
Deep Popliteal	Behind stifle on gastrocnemius between semitendinosus and biceps femoris
Gastric	On course of gastric vessels and between folds of stomach
Hepatic or Portal	At hilus of liver near vessels
Celiac	At origin of celiac artery
Mesenteric	Along attached border of intestine between layers of mesentery

